

FLORA OF ASSAM

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RANUNCULACEÆ TO ELÆOCARPACEÆ



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PREFACE

The first volume of the "Flora of Assam" is presented to the public. A considerable time has elapsed since the first conception of publishing a comprehensive account of the Flora of the province as a botanical unit and an apology is necessary for the delay, but for a large work of this nature it was inevitable. The death of Rai Bahadur U. N. Kanjilal, who originally undertook this work, caused the first interruption and then his son Mr. P. C. Kanjilal, L.F.S., B.Sc., of U.P. who agreed to continue the task from a sense of filial duty, had to return to his province before publication of this work could be taken up. The present writer, who succeeded Mr. P. C. Kanjilal, had to face great difficulties with the selected Press, which proved both highly unsatisfactory and dilatory, so much so that new publishers have had to be found. It is now hoped that the publication of succeeding volumes up to Coniferae will not present any further difficulties.

Monocotyledons will, it is presumed, be an entirely separate publication.

Shillong,

A. DAS

15th April, 1934.

INTRODUCTION

Assam Flora is by no means an untrodden ground. Wallich and Griffith explored parts of the province and Sir Joseph Hooker himself paid a visit to the Khasi Hills. Many enthusiastic collectors namely Klien of Cachar, De Silva of Sylhet, Peal of Sibsagar and Commissioner Jenkins of the Brahmaputra Valley contributed large numbers of specimens to the Sibpur herbarium. In recent times perhaps the most energetic worker in this field was Mr. C. B. Clarke, who traversed the whole province several times on foot and made a very extensive collection. Mr. Gustav Mann (the first Conservator of Forests in Assam) has left for his successors a fairly large collection of specimens besides generally contributing to the Sibpur herbarium. Mr. Burkill visited parts of the Khasi Hills and N.E. F. Tract.

Parties of the Botanical Survey of India have, from time to time, been sent out from Sibpur to collect specimen in selected localities.

What was wanting was that no one collected with any idea of presenting to the public a comprehensive 'Flora of Assam' as a botanical unit. This idea was first conceived by Chief Commissioner Sir Archdale Earle, an ardent lover of plants and a keen amateur botanist, and under his patronage the late Rai Bahadur U. N. Kanjilal began working on the compilation of a 'Flora of Assam'. Unfortunately his death before the publication of even the first volume retarded the progress of the work, but his monumental collection, elaborate field notes and drafts have been invaluable to his successors. In subsequent years the collections of Mrs. N. E. Parry in the Garo and Lushai Hills and that of Dr. N. L. Bor, D.Sc., I.F.S., in the Naga Hills and Aka Hills have been a great asset to the province. Mr. P. C. Kanjilal, I.F.S., B.Sc., whose services were obtained on loan from U. P. on the death of his father and who had to return to his province was concerned chiefly in the determination of species, in replenishing the herbarium

and inaugurating a proper herbarium for Assam out of the material available.

He completed the final draft upto Calyciflors and described a few families of Apetalæ before leaving Assam. Thanks are due to him for his absorbing interest in this work and labour of love, so much so that he ungrudgingly devoted his entire leave (nearly 10 months) making progress in his work. It fell to the lot of the writer to complete the work up to Conifera, to replenish the herbarium and see it through the Press.

Thanks to the combined labour of many workers, the Assam Flora is fairly well represented in the herbarium of the Royal Botanic Garden at Sibpur through which,—Kew and many other herbaria have received contributions. It may also be mentioned here that the Assam Herbarium has also contributed to the herbaria at Sibpur, Dehra Dun, Gauhati and other places.

The arrangement of the families have been based mainly on Betham and Hooker's Genera Plantarum which has been hitherto generally followed in this country. A few modifications have been made in conformity with modern conceptions where necessary and the termination of *aceæ* has been adopted for all families according to present conventions.

Some herbaceous plants have been included, which are beyond the real scope of this work and also a few, that are properly speaking not indigenous to the province. Their economic value and botanical importance warranted this step.

As far as practicable forest characters have been given for the identification of the important forest species *in situ*.

Many new species have in recent years been recorded from the province in different publications of which there are no specimens in Indian herbaria. As far as practicable these have been included.

A new Magnoliaceæ was discovered by the writer in Digboi Reserve in Lakhimpur District, but as he was then engaged in Divisional Forest work, the investigation of the species could not be taken up by him in time.

At the request of Mr. Dandy of the British Museum, complete specimens were forwarded to him who described the plant as *Pachylarnax pleiocarpa*, Dandy. (Journal of Botany, November, 1933.)

The following species, new to science, have recently been described and published (The Assam Forest Records Vol. I, 1934)—

- Eurya japonica* var. *nitida* forma Kanjilali. (Ternstroemiaceae.)
- Sterculia khasiana*. (Sterculiaceae.)
- Gymnocladus assamicus* (Leguminosae-Cesalpinieae.)
- Lagerstroemia minuticarpa*. (Lythraceae.)
- Agapetes* Kanjilali. (Vacciniaceae.)
- Maba cacharensis*. (Ebenaceae.)
- Symplocos Pealii*. (Styraceae.)
- Chirita mishmiensis*. (Gesneraceae.)
- Strobilanthes furcatus*. (Acanthaceae.)

A new Myrtaceae (*Eugenia*) and some Lauraceae are under investigation and revision of the Assam *Phoebes* has also been undertaken by the writer and it is hoped that the results of these investigations will be included in the Flora.

The following annexures are given :—

- (1) An Ecological Sketch of the Botany of the Province by the late Rai Bahadur Upendra Nath Kanjilal.
- (2) A Note on the Geology of Assam by Mr. Evans, Geologist to the Burmah Oil Company Limited.
- (3) A Note on Climatology.
- (4) Bibliography.
- (5) Synopsis of Families.
- (6) Glossary of Botanic Terms.
- (7) List of Abbreviations and Signs.

It now remains to acknowledge indebtedness to all those who have rendered assistance in the compilation of this voluminous work.

- (i) Director of Royal Botanic Garden Sibpur ; Directors of Kew and the late Mr. J. S. Gamble contributed enormous help in determination of the species and scrutinising dubia sheets.
- (ii) Most of the Forest Officers of the province have contributed by supplying good collections of specimens and furnishing vernacular names which enabled me to make it comprehensive.
- (iii) Mr. Evans has contributed a most interesting Geological note of the province and the Director

Meteorological Department, Poona, has supplied details of records of humidity and temperature of the different stations in the province.

I am personally grateful to Messrs C. C. Calder, Superintendent, Royal Botanic Garden, Sibpur, K. Biswas, M.A., Curator, Sibpur Herbarium, and C. E. Parkinson, Forest Botanist, Forest Research Institute and College, for their ungrudging help in all possible directions, to Mr. C. Purkayastha for going through the proofs and also to the authorities in Assam for their encouragement without which it would not have been practicable for me to complete and publish this voluminous work.

Shillong,
1st May, 1934.

A. Das.

A BRIEF ECOLOGICAL SKETCH OF THE BOTANY OF ASSAM.

Rainfall and the configuration of the ground are the two chief factors which control the distribution of the plants and their grouping into the main types of forests association.

The province consists of two large valleys, the Brahmaputra and the Surma, separated by a range of comparatively low hills.

The Surma Valley is almost due north from the apex of the Bay of Bengal and is directly open to the N.-W. monsoon. The hills on the northern border of this valley are cliffy almost throughout and present an abrupt barrier to the rain clouds, with the result that extraordinarily heavy precipitation takes place over the cliffy region which subjects the valley to very heavy floods. The notoriously wet Cherrapunji is situated on the brow of one of the cliffs of this region.

The Brahmaputra Valley is much less open as it presents only its mouth at the western end rather tangentially to the monsoon current. It receives its rain partly from the half-spent clouds that soar above the Mikir Hills and drift northward and partly from those which enter the valley at Dhubri. In the angle formed by the Mikir and the Naga Hills there is a belt which is away from the main direction of the Brahmaputra current and over which the Surma Valley clouds pass without precipitating. This belt is the driest region in the whole province, the rainfall being as low as only about 40 inches. Another belt of low rainfall lies along the foot of the Himalayas extending from the Champamati river in Goalpara to the Panch Nadi in Darrang. The Brahmaputra clouds pass up away from this belt and it can get no benefit from the Surma clouds. Both currents impinge on the next range of Hills, the Himalayas, at a point opposite Tezpur and they combine to drift towards the apex of the valley giving very heavy rains to Sadiya, Dibrugarh and adjoining tracts.

The two dry belts mentioned above are characterised by having a pre-eminently deciduous type of forest, whereas the regions of heavy rainfall are clothed with evergreen forests.

The Sal-bearing areas of the Province are intermediate between the above two extremes where the rainfall is well below 100 inches. As might be conjectured some Sal tracts are so wet as to partake of the character of evergreen forests, for example, those near Haltugaon in Goalpara and some parts of the Boko Range in Kamrup, but the main Sal areas belong to the deciduous type.

Swamp forests own their origin chiefly to configuration of the ground sometimes aided by the occurrence of an impervious substratum such as clayey or rocky beds.

Extensive grass lands occur in the deciduous tracts, also in the riparian areas of the Brahmaputra and its tributaries.

It will be seen from the above that the flora of Assam comprises the following types of forests.

1. Evergreen Forests
2. Deciduous Forests
3. Swamp Forests
4. Grass-lands

1. The Evergreen Forests

This type of forests occupies the major parts of the Frontier District, Lakhimpur, Sibsagar, Sylhet, Cachar, also in a more or less continuous narrow belt along the foot of the Himalayas from the extreme N.-E. corner of the Province as far west as the Panch Nadi in the Darrang District. It also occurs in the S.-E. portion of the Nowgong District along the A. B. Railway and in the greater parts of the Khasi Hills including the tracts covered by the Khasi Pine (*Pinus Khasya*), also in isolated pockets in the deciduous types of forests throughout the province.

The evergreen forests consist of a bewildering number of species, chiefly of the following Families:—Dilleniaceæ, Anonaceæ, Magnoliaceæ, Guttiferæ, Leguminosæ, Myrtaceæ, Styracæ, Ebenaceæ, Myristicaceæ, Lauraceæ, Euphorbiaceæ, Fagaceæ, Palmæ and Graminæ and in the hills Coniferæ, Vacciniaceæ, Ericaceæ, and Ternstroemiaceæ, also a much larger number of Fagaceous species. The actual species of the above Families occur in different tracts in varying proportions so that a particular species may form gregarious forests in some localities and at the same time be totally absent in adjoining parts.

The forests generally present a three-storied appearance of which the top storey is very often constituted by one or two deciduous species of enormous size such as *Dipterocarpus*

pilosus, *Artocarpus Chaplasha*, *Tetrameles nudiflora*. These trees tower above the rest of the forest more or less in an isolated manner. They are generally fast-growers and also deciduous ; they can easily work their way through the crowns of the storeys now below them. The middle storey is formed either by a gregarious species, such as *Mesua ferrea*, or by a large number of mixed species of the families mentioned above. This storey determines the economic value of a forest. Where *Mesua ferrea* grows it is considered the principal species, but recently Bonsum which comprises two or three species of *Phache* has fairly established itself in the Calcutta market and is very much more in demand than *Mesua ferrea*. *Lagerstrœmia Flos-Reginæ* is another well known timber tree, but strictly speaking it is not confined to the evergreen type of forests. *Terminalia myriocarpa*, *Amoora Wallichii*, *Duabanga sonneratioides* are other well-known timber trees in this type of forests. The third or lowest storey consists of small trees and shrubs, generally of no great economic value.

This type is characterized by a very large number of climbers notably the climbing *Acacias* and *Bauhinias*, several species of *Vitis*, *Unona*, *Uvaria*, *Mexoneurum*, *Calamus*, *Tapiria hirsuta*, *Entada scandens*, *Dalhousiea bracteata*, *Gnetum Gnetum* and many others.

As indicated above the pine areas in the Khasi Hills fall under evergreen type of forests. The Khasia pine forms even-aged pure forests on moderately sloping hill-sides between 2500 and 6000 ft. A complete leaf canopy is formed at a very early stage and maintained till the high pole stage is well passed. This type of forest is remarkably free from climbers. Natural regeneration is easy to secure, but the Synteng Village Communities in the Jawai Sub-Division prefer to obtain new crops by sowing. All that is necessary after sowing is to close the plots against fire and grazing for a suitable period. Once the pine is established, the grass very soon disappears so that nothing is left to attract browsing animals. The pine is associated with several species of *Quercus* and *Castanopsis* with birch and in some places with yew, hornbeam and *Podocarpus neriifolia*.

Besides the pine areas we have in the Khasi Hills a very interesting type of forests commonly known as sacred forests. They generally occupy hill-tops and cool aspects as a rule above the pine zone. They belong to local chiefs or village communities and represent what may be called nature's

primeval forests. Until recently people did not dare to make fellings in these forests or obtain anything from them except fallen fruits and dead timber for fear of annoying the Sylvan gods believed to preside over them, with the result that we possess in them very rich store-houses of botanical treasures. It is indeed to these fascinating groves that the Khasi Hills owe the reputation they enjoy of being the richest botanical area not only in India, but perhaps in the world. Magnoliaceous, Fagaceous, and Lauraceous trees, generally of enormous sizes, are the predominating arboreous species besides such characteristic trees as *Dendropanax japonicum*, *Randia Wallichii*, *Croton laevigatus*, *Myrsine capitellata*, *Taxus baccata*, *Podocarpus nerifolia*, *Daphniphyllum himalayense*, *Eriobotrya bengalensis* and many others. But botanically speaking shrubs, undershrubs and herbs, if less showy are far, far more interesting. These however are so numerous that the writer is obliged to refrain from mentioning them in this very brief paper, and he frankly confesses that he is acquainted with only a very small proportion of them.

It is a great pity that the black foot of destruction is already visible in some parts ; the ultimate disappearance of these charming groves is therefore only a question of time.

2. The Deciduous Forests

This type comprises all the Sal tracts as well as the major part of scrub forests in the province. It therefore takes in nearly the whole of the Goalpara and Garo Hills Districts and the greater part of Kamrup, Nowgong and the North Cachar Hills, also the western half of Darrang and the drier tracts of the plains of the Surma Valley.

In the Sal areas the usual companions of Sal occur with local variations. *Lagerstræmia parviflora*, *Kydia calycina*, *Schima Wallichii* and *Careya arborea* being perhaps more constant than the rest. *Gmelina arborea*, *Cassia fistula*, *Albizzia lucida* and *odoratissima*, *Millettia velutina*, *Stereospermum chelonoides* occur in some localities.

Where there is no Sal as in the North Cachar Hills, and in the drier parts of Cachar and Sylhet, the forest is very mixed and consists chiefly of *Bombax malabaricum*, *Adina cordifolia*, *Stephegyne diversifolia*, *Cassia nodosa*, several species of *Ficus*, besides most of the associates of Sal mentioned above.

The differentiation of storeys is not so clear in deciduous forests as in the evergreen type. A certain amount of grass

is almost everywhere present, but no canes occur except in evergreen or marshy pockets here and there.

3. Swamp Forests

This type includes undrained depressions generally known as *Bils*. Swamps and *Bils* abound in the plains of Sylhet and Cachar some of the latter being so large as to deserve to be called lakes. If much smaller in size they are not uncommon in the Brahmaputra Valley chiefly in the grass lands in the riparian tracts and the Sal areas in Kamrup and Goalpara. Some of the latter are up to 5 miles in length and about 3 miles in breadth. Depressions of the former kind are mostly abandoned river channels but those in the Sal areas appear to owe their origin to earthquakes.

The following trees and shrubs are characteristic on the border of the larger *Bils*, especially of those situated in hilly tracts :—*Cratogeomachra lophosperma*, *Eugenia cuneata*, *Duabanga sonneratioides*, *Terminalia myriocarpa*, *Lagerstrœmia Flos-Reginae*, *Hyptianthera stricta*, *Symplocos Pealii*, *Ardisia khasiana*, *Rhabdia lycioides*, *Litsea zeylanica* and *angustifolia*, *Homonoia riparia*, *Antidesma Bunius*, *Trewia nudiflora*, *Ficus pyriformis*, *heterophylla*, *Cordia*, and *glomerata*, *Engelhardtia polystachya*, *Dracæna spicata*, *Clinogyne dichotoma*, etc., as well as the following grasses, *Hygrophiza aristata*, *Vossia procera*, *Panicum proliferum*, *kashianum*, *interruptum*, *plicatum*, *Myurus*, *Crus-galli* and *cæsius*, *Phragmites communis* and *Karka*, *Arundo Donax*, *Arundinella arenacea*, *Thysanolana Agrostis* etc. Some of the above grasses (*Hygrophiza*, *Vossia*, etc.) float on the surface and cover considerable parts of the water along the borders.

The following aquatic families are also well represented *Nymphaeaceæ*, *Araceæ*, *Lemnaceæ*, *Alismaceæ*, *Naiadaceæ*, *Eriocaulaceæ* and *Cyperaceæ*.

4. Grass-Lands

Pure grass lands are of two types in Assam, viz., the riparian tracts of both valleys and the belts of low rainfall mentioned above. Nearly the whole of the former is under water during the rains, and the permanent water-level is never so low as to be beyond the reach of the roots of the grass. Grasses of the following genera are characteristic of the riparian areas, *Saccharum*, *Anthisteria*, *Erianthus*, *Arundo*, *Phragmites*, etc. They cover extensive tracts along the

large rivers, especially where the banks are low. Most of them are remarkable for the enormous size their haulms attain, some being up to 20 ft. in height and nearly 2 inches in diameter at the base, so that they can easily hide large herds of buffaloes and even of elephants.

In the dry belts grasses generally smaller in size but of a more hardy nature predominate. In the Sub-Himalayan dry belt the permanent water-level is in places as low as 300 to 500 ft. below the surfaces so that the roots of the grasses have to draw sustenance entirely from the hygroscopic moisture of the surface soil.

The following grasses are characteristics of the dry tracts, *Imperata arundinacea*, *Aptuda varia*, *Andropogon Icarancusa*, *Nardus contortus* and *squarrosus*, *Pollinia ciliata*, *Erianthus elephantinus*, *Panicum assamicum*, *Anthistiria giganta* and *strigosa*; *Setaria glauca*, *Rottboellia protensa*, *Isachne australis*, *Saccharum Narenga*, *Neyraudia madagascariensis*, *Paspalum scrobiculatum*, *Ischemum ciliare* etc.

Shillong,

4th December, 1922.

U. N. KANJILAL

The Himalayan *sub-alpine* forests on the Northern Frontier of the Province has, of late years, been explored by Dr. N. L. Bor, who has made many interesting records of plant life from the area.

A. DAS

A SUMMARY OF THE GEOLOGY OF ASSAM

BY

P. EVANS, B.A., F.G.S.,

Geologist, The Burmah Oil Co., Ltd.

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PREFACE

Mr. H. M. Sale, Senior Geologist to the Burmah Oil Company in India, and Mr. P. Evans, the author of this note, have generously offered to regard this note, after modifications or amplification in the Geological Survey of India, as a joint production by an officer of this Department and Mr. Evans, so as to give expression to the fact that it is in part based on the pioneer work of the Geological Survey of India. This admirable summary of the geology of Assam has, however, been compiled entirely by Mr. Evans, and it is appropriate that he should be credited with the full authorship. Reference to the more important papers of his predecessors is provided by the appended Bibliography.

L. L. FERMOR,

Director,

GEOLOGICAL SURVEY OF INDIA

A SUMMARY OF THE GEOLOGY OF ASSAM

INTRODUCTION

Geological Formations

1. The geological formations of the province of Assam may be grouped as follows :—

Alluvium	}	Sedimentary
Tertiary		
Cretaceous		
Gondwana		
Igneous and Metamorphic.		

These major divisions are separated by unconformities.

Sedimentary Rocks

2. A large part of the province is covered by *alluvial deposits* of a very varied character—pebbles, sand, clay, and very commonly a mixture of sand and clay, often with much decomposed vegetable material. The *Tertiary beds* include a similarly varied assemblage of rocks—hard sandstones, soft loose sands, hard conglomerates, soft loose pebble beds, coal seams, shales, clays; clayey and shaly sandstones and sandy shales and sandy clays are very common. In several areas the more porous sands contain oil—usually present only in small quantities. The lowest Tertiary beds of some parts of Assam include thick limestones. A classification of the Assam Tertiaries has been worked out by the Burmah Oil Company's geologists starting from the basis laid down by F. R. Mallet, one of the pioneers of the Geological Survey of India. The major divisions are

- Dihing Series
- (Probable unconformity)
- Tipam Series
- Surma Series
- (Unconformity)
- Barail Series
- Jaintia Series
- Disang Series.

These are placed in order of age (the Dihing Series being the youngest) excepting that the Disang Series is thought to be partly equivalent to the Jaintia Series. The *Cretaceous beds* are mainly sandstones and conglomerates but include some shales and thin coal seams. The *Gondwana beds* include quartzites and shales also with thin coal seams.

Igneous and Metamorphic Rocks

3. Igneous rocks, other than those forming part of a metamorphic complex, are not very abundant, basalt being the most important rock. Serpentine is found in association with slightly metamorphosed shales and amongst the older metamorphic rocks are gneisses, schists and quartzites. Granite, peridotite and dolerite are found intruded into the metamorphic rocks.

Topographical Divisions

4. The topography and geology of Assam are so intimately related that it is convenient for descriptive purposes to adopt the usual topographical divisions of the province. Assam may conveniently be divided into five parts—

From north to south:—

- (i) The Aka, Abor, Mishmi and neighbouring hills forming the eastern part of the Himalayas
 - (ii) The Brahmaputra Valley
 - (iii) The Central Assam Range—including the Garo Hills, Khasi and Jaintia Hills, North Cachar Hills, Mikir Hills
 - (iv) The Surma Valley
- and forming the eastern and south-eastern portions of the province—
- (v) The Naga Hills, Manipur, and the Lushai Hills

5. In general, the two valley areas are largely alluvial; the Central Assam Range is mainly gneiss with a fringe of Tertiaries on the south and east; the northern ranges include metamorphic rocks with a fringe of Tertiaries on the south; and the remaining area—the eastern, south-eastern, and the southern part of the province—is composed principally of Tertiary rocks.

6. The connection between geology and topography is so very close that the geologist visiting Assam soon recognizes that in the greater part of the province every major hill range and valley is a direct or indirect expression of some geological feature. The geology of the province has not yet been sufficiently elucidated to permit a full reconstruction of the geological history, but for the more accessible areas it is possible to indicate with certainty the general process by which the present topographical features have been developed.

7. In many parts of the country there is, too, a close connection between the geology and the type of jungle, but this is to some extent masked by the recent history of the area, as for example, the extent of recent Jhum operations, and by the variations in climatic conditions. The type of relationship found may be illustrated by the distribution of thorny canes which, in the hilly tracts, often occur in quantity in association with sandstones, not on the scarp faces but on any water-logged level stretched above the actual scarp.

8. The following notes describe the strata and structure and give some account of the topography of the five areas enumerated above, taken for convenience in the following order:—Surma Valley, South-Eastern Hills (Naga-Manipur-Lushai Hills), Assam Valley, Eastern Himalayas, Shillong Plateau (including the Mikir Hills, etc.). Following this is a summary of the geological history of the whole province.

9. The information utilized in this summary is derived, for the older rocks, from the observations of the Geological Survey of India and for the Tertiaries mainly from the work of the Burmah Oil Company's geological staff.

TOPOGRAPHY, STRATA, AND STRUCTURE

The Surma Valley

10. The main part of the Surma Valley consists largely of swampy flats broken by numerous low isolated hills (tilas) and low ranges. Northwards it ends abruptly against the foot of the Garo and Khasi and Jaintia Hills but the south-eastern boundary is of a different character—long spurs of high land project from the Lushai and Tripura Hills, and between them are broad valleys usually diversified with many low isolated hills and low ranges. The difference results from the difference in geological structure: the

northern boundary is determined by the existence of an east-west 'monoclinial' fold separating the Tertiaries of the Surma Valley from the older rocks of the Shillong Plateau, but along the southern boundary the strata have been buckled or folded into north-south wave-like 'corrugations' which give rise to the alternations of lines of hills and valleys; not every line of hills is a line of uplift ('anticline'), nor is each valley a line of depression ('syncline') for the folding has led to the development of long, nearly straight, north-south valleys by the wearing away of the less resistant beds, particularly clays and shales, leaving parallel ridges where the harder strata have more successfully withstood the denuding action of the rain and streams; in a few instances, where the beds exposed in the centre of an anticline are relatively soft, a valley may coincide with an axis of uplift. Thus, although the very clearly-marked suite of parallel north-south valleys and hills is due primarily to the trend of folding, it is in part an indirect result.

11. In the corrugations, the tops of the arches are usually narrower than the bottoms of the troughs and the inclined flanks separating crest from trough are very steep, the strata dipping at high angles. In many instances one of the flanks of the fold is much steeper than the other, and in these asymmetric anticlines it is common to find strike-faulting accompanied by vertical and inverted strata.

12. The strata of the Surma Valley belong entirely to the newer divisions; even the oldest series of the Tertiaries is not found in the valley itself, although it occurs in the low foot-hills of the Shillong Plateau. The oldest rocks found within the valley are the sandstones of the Barail Series, but these occupy a very small area. The lower beds of the Surma Series form fairly high and usually compact groups of hills; these are generally unsuited to tea-growing and are mostly covered with jungle; the Haragaj range between the Juri and Manu valleys forms a typical example. The beds include alternating groups of impure sandstones and impure shales. The upper beds of the Surma Series are mainly soft sandy shales with thin sandstones; they naturally give rise to long strips of low swampy ground broken by lines of tilas. Many of the lower more scattered hills of the Surma Valley are made up of sands and subordinate sandy and mottled clays belonging to the Tipam Series. The lower beds of the Tipams are usually much harder than the upper beds, and as they are also harder than the immediately underlying strata of the Surma

Series, the lowest part of the Tipams usually forms a prominent strike ridge. Most of the tea cultivation in 'tila' gardens in the Surma Valley is on the Tipam beds or the uppermost Surma beds. The highest division of the Tertiaries, the Dihing Series, which is made up largely of pebble beds, is found in a few low hills on the north and east of the valley.

13. An interesting feature is the occurrence of plateau gravels, deposited when the Barak and its tributaries were flowing at a level several hundred feet higher than to-day. There is an extensive plateau near Dewan (east of Silchar) and a higher more dissected plateau near Kumbhir (north-east of Silchar). On these there is a thick nearly horizontal capping of pebbles with some sands and sandy clay; most of the plateau is, or has been, under tea cultivation.

14. The flat ground is largely occupied by a rather clayey alluvium; most of this is utilized for rice but, especially in Sylhet, there are large areas too low-lying for any cultivation, and many of these contain large 'bils' or 'haors'—broad expanses of perennial water. In this alluvial ground the large streams have cut deep beds following very tortuous and unstable courses. Changes in these courses have led to the formation of many crescent-shaped lakes (frequently named Anua Bil) which in course of time become silted up, but remain easily recognizable by their characteristic shape. These old stream channels are commonly marked by a line of homesteads following very closely the former bank of the river.

The South-eastern Hill Country (Naga Hills to Lushai Hills).

15. The large area of hills forming the eastern and south-eastern borders of Assam and including the Naga Hills, Manipur, and the Lushai Hills is made up principally of Tertiary strata but it is possible that older formations occur in the areas furthest from the plains. Parts of this hill country have been examined in some detail but the geology of the more remote parts awaits investigation. Included in this area, both topographically and geologically, is the south-eastern part of the North Cachar Hills.

16. In the south—the Lushai Hills, western Manipur, and eastern Cachar—the structure is similar to and in continuation of that of the south-eastern part of the Surma Valley. Further north there is an interesting difference; the folding

in the Surma Valley was referred to as a series of north-south corrugations in which the arches are steep-sided, the strata in the steepest parts of the fold being vertical or even inverted, but in the Naga Hills simple anticlines are rare and the folding has reached a much more advanced stage in which the steep limbs of the folds have become entirely or almost entirely replaced by strike-faults so that the country is traversed by a series of large overthrust faults. The most important of these is the Haflong-Disang fault which begins in the hills bounding the Surma Valley to the north of Sylhet and runs through Haflong, towards Piphima (near Kohima) and thence roughly parallel to the edge of the hills as far as the headwaters of the Dihing.

17. On the south-east side of this large fault, in the extremely hilly country between Haflong and Imphal, is a broad synclinal area composed chiefly of sandstones—these form an impressive escarpment south-east of the 'Hill Section' of the Assam Bengal Railway from Ditokchara to Mahur, and from the name of this range these beds have been termed the Barail Series. Further north-east around Kohima and Mokokchung in the Naga Hills District are lower beds—the Disang Shales—which are of great thickness and cover an immense area. In the interior of the hills the shales pass into slates and are traversed by abundant quartz veins, and in the extreme east by serpentine intrusions. They are everywhere very sharply folded and faulted and no details of the structure of the shale area have as yet been deciphered although it is clear that here and there there must be large 'outliers' of the Barail Series.

18. The Naga Tribal Area and the Frontier Tracts near the Patkai Range have naturally not been examined in much detail. The Patkai Range near the pass over to the Hukong Valley is a scarp of the sandstones of the Barail Series—one of the many ridges bounded on the north-west by a strike valley due to Disang Shales and to one of the overthrust faults. It is probable that most of the Naga Tribal Area is occupied by Disang Shales and the lower beds of the Barails.

19. In the area north-west of the Disang fault, that is, in the ranges bordering the Dhansiri and Upper Assam plains, there are numerous strike-faults roughly parallel to the Disang Fault. The dip of the strata is towards the south-east and the beds, which include Dihing, Tipam, Surma and Barail strata, are repeated by the faults; this has given rise to a series of nearly parallel ridges, not as well marked as

in the simpler structure of the Surma Valley, but very well seen from many points along the Manipur Road—Tinsukia section of the Assam Bengal Railway. The ridges are the escarpments of the harder beds—Tipam and Barail sandstones—and the intervening valleys mark the outcrop of softer beds and the position of the strike-faults.

20. In this area the Barail Series shows an interesting development; in the south-western part of the Naga Hills, interspersed amongst the sandstones in the middle part of the series, are considerable thicknesses of shale and carbonaceous shale. A few thin coal seams occur and when traced north-eastwards it is found that the seams thicken and become more numerous, until at Nazira they are of workable thickness. Further north-east they are still thicker and are worked on a large scale near Margherita and Ledo.

21. Above the Barail Series there is an important unconformity which represents an interval during which a large part of the Tertiary area of Assam was uplifted to form land and subjected to denudation. The emergence was greatest in the north-east, and here, not only is the upper part of the Barail Series missing, but the overlying Surma Series is very poorly represented, and in places the sandstones of the Tipam Series rest on the Barails.

22. With the exception of the Manipur plain, there is very little flat ground within the area of hills; the valleys are narrow and steep-sided and there are but few level stretches of alluvium in the valley bottoms. There are a few accumulations of high level 'gravels' or boulder beds in several parts of the Naga Hills, as for example near Ghaspani on the Kohima cart-road, and parts of the Disang Shale outcrop below the Barail scarp are almost completely covered by a thick mantle of sandstone boulders. These boulders form a useful source of road metal and ballast and are extensively worked at Ditokchara in the Hill Section

The Assam Valley

23. The Assam Valley may be divided into two parts; in Lower Assam the plains are broken by isolated groups of hills but in Upper Assam almost unbroken plains stretch from the Himalayas on the north-west to the Naga Hills on the south-east.

24. The numerous low hills of Dhubri, Goalpara, Gauhati, and Tezpur are actually outlying portions of the Shillong metamorphic complex and are composed for the most part of gneiss. The surrounding plains have been

formed by the alluvial material brought down by the Brahmaputra and its tributaries. The Assam Valley is narrowest near the Mikir Hills, where the river first encounters the gneiss, and above this point the valley is entirely devoid of tilas. The extensive plains of Sibsagar and Lakhimpur are the alluvial deposits of the Brahmaputra and its tributaries; there are distinct traces of deposits of different ages, the most recent alluvium within the present flood plain, and various patches of older deposits at a slightly greater elevation. The geology of the alluvial area has not been worked out in any detail; on the whole, the alluvium is more sandy than in the Surma Valley. Towards the head and sides of the valley the surface is slightly undulating, and there occur, as for example near Dum Duma, examples of broad gently sloping alluvial 'cones' with irregular almost dry channels marking the site of old courses of tributary streams.

25. River terraces flank some of the streams; good examples are to be found along the Dihing at Margherita and much further upstream.

26. At the head of the Assam Valley there are low spurs (such as the Tipam Hills of Jaipur and Digboi) which are structurally a part of the Naga Hills.

27. The foot-hills bounding the valley on the north-west and south-east are composed of Tertiary deposits (as mentioned in the adjacent sections of this note) and deeply buried beneath the alluvium there must be a floor of similar Tertiary beds. The thickness of the alluvium is unknown but it probably amounts to some thousands of feet in the centre of the valley.

The Eastern Himalayas

28. North of the Brahmaputra Valley the hills curve round from an east-west direction in the Balipara Frontier Tract to a north-east trend which continues to the Dibang north of Sadiya. Thence there is a big sweep round the head of the valley to the Mishmi or Miju Hills.

29. The structure of these hills has not been worked out, although some of the main outlines are known. A belt of Tertiary beds occurs in the first ranges of the Aka, Dapla, and Abor Hills, but is absent further east; beyond the Tertiary belt there occur beds of Gondwana age, corresponding approximately to the coal-bearing beds of the Bengal coal-fields and indeed containing thin but crushed coal seams. In the Dihang Valley these are associated

with volcanic rocks—basalts and tuffs. Beyond the Gondwana beds are schists, slates, limestones, and dolomites of very great age.

30. The structure is undoubtedly complex for the beds dip north-westwards so that the Tertiaries appear to underlie the much older rocks. From evidence in Himalayan areas that have been examined in more detail it appears that the belts of different beds are separated by very large overthrust faults, similar to, but greater than, those which have been proved by detailed investigations in the Naga Hills. The successive sheets of rock have been thrust forward and upward from a north-westerly direction during the building up of the Himalaya.

The Central Assam Range

31. In the west, the Central Assam Range consists of a large broken plateau, usually termed the Shillong plateau; eastwards this merges into the more irregular hills of North Cachar and thence joins the Naga Hills. Geologically the two portions are quite distinct, the western part being an area which has undergone very little Tertiary folding and the eastern part belonging to the area of very intricate faulted and folded structure already described. Near Haflong the junction of the plateau country and the hill country is very sharply marked, coinciding with the Haflong-Disang overthrust fault, but in the northern part of the Assam Bengal Railway Hill Section the transition is more gradual.

32. The plateau reaches a height of over 6000 feet near Shillong; it has a general northerly slope but is much dissected by deeply cut valleys and is traversed by step-like scarps. The valleys are often notably straight and steep-sided and there are many large waterfalls in the rivers. The southern edge of the plateau overlooks the Surma Valley and is remarkably abrupt.

33. A large part of the area is occupied by metamorphic rocks of great age—schists, quartzites, and gneisses, with granites, peridotites and dolerites intruded into them. The details of the greater part of the metamorphic area have not yet been investigated. The gneiss is composed mainly of quartz and felspar (orthoclase predominating) with subsidiary magnetite and very little hornblende and mica. Less ancient are the schists, slates, quartzites and conglomerates which have been grouped together as the Shillong Series. These rocks (especially the schists) have been invaded by basic dykes

and, apparently subsequently, there were the intrusions of granite.

34. The metamorphic rocks of the Shillong plateau extend northwards across the Brahmaputra Valley, forming low isolated hills at intervals west of Tezpur and higher hills near Gauhati and Goalpara. (The gneiss is very clearly seen near Gauhati in railway cuttings and in the river bank). Similar gneiss forms the greater part of the Mikir Hills.

35. Of much later age is the Sylhet Trap, an andesitic or basaltic lava found along the extreme southern margin of the plateau. This lava is associated with volcanic 'ash' and intrusive dykes.

36. Overlying the trap and the gneiss are Cretaceous beds—sandstones with conglomerates. These rest on a very irregular surface, filling up old valleys eroded in the metamorphic rocks in pre-Cretaceous times. The Cretaceous beds occur in the southern foot-hills and as isolated outliers scattered over a large part of the southern portion of the plateau; they form a belt extending across the plateau from near Jaintiapur north-eastwards towards the Mikir Hills. They occur near Lumding but are unknown further north-east. Coal seams occur locally and in places these are of workable thickness.

37. The Cretaceous beds are overlain by the lowest Tertiaries. These contain thick limestones (Sylhet Limestone) which provide an important source of lime; these beds are of considerable interest as their solubility in rain water has given rise to caves and underground rivers—phenomena that are characteristic of limestone areas. The outcrop is marked by numerous swallow-holes and at the base of the limestone cliffs there are often to be found copious springs of water. Associated with and above the limestones are sandstones and shales with a few thin coal seams. These beds lie almost horizontally (but with a very slight south-easterly inclination) over a large area in the eastern part of the plateau and extend north-eastwards into the Mikir Hills.

38. In the north-western part of the North Cachar Hills, sandstones of the Barail Series predominate and the beds are no longer nearly horizontal but have an undulating dip and are traversed by zones of disturbance; further east the disturbances increase and higher members of the Tertiaries appear in the synclinal areas: in this way the plateau zone passes into the parallel ranges of the Naga Hills.

FOSSILS

39. The strata of Assam are notable for the paucity of fossil remains. The Cretaceous beds contain a small fauna which has affinities with the Cretaceous fossils of Madras. The lowest beds of the Tertiaries contain a large number of fossils but the remaining, and by far the greater, portion of the Tertiary strata is almost barren, thus contrasting strongly with the very fossiliferous Tertiary beds of Burma.

40. The Sylhet Limestone is in places very largely made up of the hard shells of Nummulites but other fossils are much less abundant; the beds immediately overlying the Sylhet Limestone have also yielded a number of fossils in a few localities. In the upper Tertiaries, fossiliferous beds occur in the Garo Hills and at Kanchanpur in Cachar; these belong to the Surma Series. A few fossiliferous localities in the Tipam Series have been reported from the Naga Hills but the fauna is very poor.

41. This paucity of fossil beds makes it very difficult to correlate the strata of different portions of Assam and also prevents any very exact correlation between the Assam Tertiaries and those of the rest of India. The fossils of the Jaintia Series show that this belongs to the Eocene and is approximately of Kirthar (Lutetian) age. The Kanchanpur and Garo Hills fossil beds contain species characteristic of the lower parts of the Miocene.

HISTORY

42. It is not possible to reconstruct with any certainty the conditions under which the older rocks were formed, but it is clear that during a large part of Tertiary times almost the whole of the south-eastern part of Assam was under water: either open sea, coastal lagoon, or river estuary. (A possible exception is the east of Manipur, about which little is known). It is likely that during much of this period there existed land to the north-west—*i.e.*, part of the Shillong Plateau.

43. It seems probable that during the earlier Tertiary times there was a shore line running roughly from south-west to north-east, through the Garo, Khasi, Jaintia, and Mikir Hills. To the south-east lay a broad sea which was continuously receiving sediments from the denudation of the neighbouring land. At some time in the Oligocene period part of the sea became almost silted up and coal-

forming conditions prevailed over a large area in north-eastern Assam. At the end of Oligocene times important earth-movements took place and large areas of the sea covering most of Assam were converted for a time into land and were subject to weathering and denudation. Subsidence set in and during the Miocene period the shore line ran again through the Garo, Khasi and Jaintia, and Mikir Hills. The water lying to the south-east was very shallow and received vast quantities of sediment from the neighbouring shores, but the water-covered area was not completely silted up, as subsidence, on the whole, kept pace with deposition. Whether the water ever completely covered the Assam plateau is not known, but it is clear that at times there must have been very little of the province that was not submerged. The Tertiary sediments in places attained a thickness of over 40,000 feet.

44. Towards the end of the Miocene period very extensive earth-movements began; there was a great change in the material brought down by the streams, widespread pebble deposits show the proximity of large rivers draining from the newly forming land. As these changes continued the land began to assume something of its present shape, but with far higher elevations than now exist. During this period the strata were in the south folded into the broad corrugations so typical of the Surma Valley, and in the Naga Hills (where they were subjected to stronger forces) the strata became broken up along immense faults, areas scores of miles in length and several miles wide being pushed forward many miles over their north-western neighbours and having in turn similar large fault masses pushed over them from the south-east. Somewhat similar but even more intense movements occurred in the Eastern Himalayas, the forces being in this case from the north and north-west. In this way great hills were piled up, leaving a broad depression between—the original of the Brahmaputra Valley. As these mountain-building movements proceeded, denudation removed tens of thousands of feet of rock from the hills, so in the course of time lowering them to their present level, the material removed being carried out to sea or deposited in the lower reaches of the streams.

45. That the mountain-building movements are still in evidence is shown by the frequent earthquakes. During the 1897 earthquake many changes of level took place and subsequent measurements indicated that the Shillong

Plateau as a whole had moved appreciably towards the plains on the south. In some of the streams in the Patkai range there are a number of partly silted up lakes and marshes which show that there, too, there has been quite recent movement along a line crossing the course of these streams. Similar comparatively recent earth-movements have produced smaller but important changes of level in the plains resulting in obstructions to drainage, and consequent water-logging of large areas.

46. The activity of present-day denudation of the hilly areas is indicated by the vast quantity of sediment carried down the rivers during the monsoon and by the abundance of landslips showing as prominent scars in the jungle-covered hills.

47. Although the larger valleys and hills owe their origin to the earth-movements that have folded and broken the Tertiary strata of the province, their present form is entirely due to weathering and to erosion by streams. It is often popularly supposed that the deep gorges traversing the hills (for example, the immense ravine seen from the Cherrapunji road, or the narrow valley of the Jatinga above Damchara) are rifts produced in the earth's crust by destructive earthquakes. This is not so; the gorges, as well as the less impressive valleys, are due to the erosion by the streams which are now, or were at some previous time, flowing through them. During the monsoon, the streams with their loads of sediment erode their beds and banks and, according to local conditions, either deepen or broaden their valleys. The harder more resistant strata tend to remain as ridges whilst the weaker beds rapidly get worn down into low ground, possibly getting completely covered by the debris resulting from the weathering of the harder beds.

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Digboi
1st. August 1934.

P. EVANS.

CLIMATE

In Assam the annual revolution of the seasons is not marked by the strongest contrast of temperature and of rainfall.

The climate of Assam in virtue of its constant high humidity has an alternation of summer and winter of which neither is extreme in its temperature.

The rise of temperature which in most parts of India follows rapidly on the vernal equinox, is, in Assam checked by frequent showers and thunderstorms, giving it a heavy rainfall during the spring or hot weather months.

The perpetual humidity, frequent and heavy rainfall and moderate temperature changes of a warm summer and cool winter especially distinguish the Valley of Assam.

The annual rainfall figures shown in the following table against each rainfall recording district in the province of Assam have been compiled from the record of five years from 1927-1931, supplied by the Agricultural Department, Assam.

District.	Normal rainfall.
Goalpara	109.05
Kamrup	81.12
Darrang	87.38
Nowgong	68.39
Sibsagar	88.19
Lakhimpur	113.17
Sylhet	135.45
Cachar	121.15
Garo Hills	107.05
Khasi & Jaintia Hills	229.23
North Cachar Hills	109.17
Sadiya Frontier Tract	143.82
Balipara Frontier Tract	96.54
Naga Hills	86.90
Manipur	59.91
Lushai Hills	108.02

The following average mean maximum and mean minimum temperatures have been calculated from the statements of the five years from 1927-1931.

Station.	M. Maximum.	M. Minimum.
Dibrugarh	81.39	65.77
Sibsagar	78.32	66.28
Tezpur	83.99	66.56
Gauhati	83.81	66.36
Dhubri	80.50	66.86
Silchar	85.57	67.44
Srimangal	86.92	66.00
Shillong	69.85	53.22
Cherrapunji	68.77	57.88

Average relative humidity calculated from figures
from 1927 to 1931

Station.	Average relative humidity.
Dibrugarh	89
Sibsagar	90
Tezpur	85
Gauhati	86
Dhubri	83
Silchar	86
Srimangal	85
Shillong	73
Cherrapunji	76

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SYNOPSIS OF THE FAMILIES.

The distinguishing characters of the families have been selected with special reference to the plants described. In the body of the work under each family an account of the family as a whole will be found. The plants here mentioned all belong to the Phanerogams or flowering plants. They are divided as follows :—

Cotyledons, two or more	...	A. Dicotyledons.
Ovules in closed ovary, fertilized through stigma	...	a. Angiosperms.
Calyx and corolla both present.		
Corolla of distinct petals	...	i. Polypetalæ.
Calyx of distinct sepals ; petals hypogynous.		
Torus small or elongate, not expanded	...	1. Thalamifloræ.
Torus thickened or expanded into a fleshy disk	...	2. Discifloræ.
Calyx of combined sepals ; disk thin ; petals inserted on the calyx.	...	3. Calycifloræ.
Corolla of combined petals	...	ii. Gamopetalæ.
Calyx or corolla or both wanting	...	iii. Apetalæ.
Ovules naked, fertilized by direct contact with pollen	...	b. Gymnosperms.
Cotyledon one	...	B. Monocotyledons.

A. DICOTYLEDONS

a. Angiosperms

i. Polypetalæ

1. THALAMIFLORÆ.

1. **Ranunculacææ.** Sepals deciduous, often petaloid. Stamens numerous, anthers adnate, longitudinally dehiscent. Carpels numerous, free, 1-celled.

2. **Dilleniaceæ.** L. alternate, simple, penninerved, petioles sheathing. Fl. large, white or yellow. Sepals 5, imbricate, persistent, petals 5, caducous. Carpels one or many, more or less cohering, styles free.

3. **Magnoliaceæ.** Trees, shrubs or climbers. Leaves alternate, simple. Sepals and petals alike in whors of three, imbricate, deciduous. Stamens numerous. Carpels numerous, free or slightly cohering. Fruit a cone or spike.

4. **Anonaceæ.** Trees or shrubs, often scrambling. Leaves alternate, entire, exstipulate. Sepals 3. Petals 6. Stamens numerous, free. Carpels numerous, free or (Anona) confluent. Fruit succulent.

5. **Menispermaceæ.** Climbing shrubs or small trees. Leaves alternate, entire or lobed, usually palminerved, often peltate. Flowers small, unisexual, trimerous. Stamens as many as and opposite the petals or anthers sessile on a column. Ovaries 1 or 3, free. Fruit a drupe.

6. **Berberidaceæ.** L. alternate, glabrous. Sepals and petals alike, usually trimerous, caducous. Stamens opposite to petals, anthers adnate, as a rule opening by valves. Carpels distinct, often one only. Endosperm fleshy.

7. **Nymphæaceæ.** Aquatic-herbs. Leaves usually peltate. Sepals 4-5. Petals and stamens usually numerous. Carpels many in pits of the torus or confluent with it. Ovary 1 or more ovuled. Fruit a spongy berry or of nuts sunk in pits of the torus.

8. **Papaveraceæ.** Annual or perennial herbs. Leaves radical or alternate, stipules 0. Flowers often large, nodding in bud, regular; perianth and stamens very caducous. Sepals 2, hypogynous. Petals 4, 2-seriate, large, crumpled. Stamens very many. Carpels dehiscing by pores or valves.

9. **Fumariaceæ.** Annual or perennial herbs. Leaves usually divided, segments not jointed. Flowers small, racemed, irregular. Sepals 2, small, deciduous. Petals 4. Fruit a 2-valved, many-seeded capsule.

10. *Cruciferae*. Herbs, rarely undershrubs. Leaves cauline and radical, exstipulate. Flowers racemed. Sepals 4, free, imbricate. Petals 4, free, hypogynous. Stamens 6. Fruit either a 2-celled 2-valved pod, the valves deciduous and leaving the seeds on the persistent placentas (*replum*), or indehiscent, or transversely jointed.

11. *Capparidaceae*. Trees or shrubs. L. as a rule alternate, stipules often present and spinescent. Fl. usually bi-sexual, often zygomorphic. Sepals usually 4, petals 4. Stamens 4-5 or numerous, filaments filiform. Carpels connate into a 1-celled ovary with 2-4 parietal placentas, often on an elongated gynophore. Fruit baccate or capsular.

12. *Violaceae*. L. as a rule alternate, stipules small or leafy. Fl. regular or zygomorphic, sepals 5, imbricate, persistent, petals 5. Stamens 5, filaments short or 0, connective broad and often produced above, anthers connivent or connate round the ovary. Carpels connate into an one-celled ovary with usually 3 parietal placentas. Seeds small, embryo straight in a fleshy endosperm.

13. *Bixaceae*. L. alternate, simple, mostly dentate, stipules small or 0. Fl. regular, 4- or 5-merous, stamens usually numerous. Ovary 1-celled, seeds few, arillate or with pulpy testa.

14. *Flacourtiaceae*. Trees or shrubs, usually thorny. Leaves toothed or crenate. Flowers small, usually dioecious. Stamens numerous. Fruit a drupe with several 1-seeded pyrenes.

15. *Pittosporaceae*. L. alternate, simple, entire, stipules 0. Fl. regular, pentamerous and pentandrous; sepals free, as well as petals imbricate, anthers versatile. Embryo small, in copious endosperm.

16. *Polygalaceae*. L. alternate, simple, quite entire, stipules 0. Fl. bisexual, zygomorphic, sepals 5, the 2 inner larger, petaloid, petals 5 or 3. Stamens as a rule 8, filaments usually connate in a cleft sheath, anthers mostly opening by terminal pores.

17. *Tamaricaceae*. L. alternate, small, generally scale-like. Fl. regular, in spikes, racemes or panicles, sepals and petals usually free, pentamerous, sometimes tetramerous. Stamens as many as petals or twice their number. Capsule 3-5-valved, seeds tufted or winged.

18. *Hypericaceae*. L. opposite, often gland-dotted, stipules 0. Fl. regular, bisexual, sepals 5, imbricate, petals 5, contorted in bud. Stamens numerous, filaments usually connate into 3 or 5 bundles, anthers versatile. Endosperm 0.

19. **Guttiferae**. Juice resinous, yellow or greenish. L. opposite, simple, entire, usually coriaceous, stipules 0. Fl. regular, unisexual or polygamous, sepals 2-6, mostly in decussate pairs, petals as a rule 2-6, imbricate or contorted. Fr. usually indehiscent, seeds large, endosperm 0.

20. **Ternstroemiaceae**. L. alternate, simple, generally coriaceous, stipules 0. Fl. regular, as a rule bisexual, sepals and petals usually pentamerous and imbricate. Stamens generally numerous, ovary 3-5-celled.

21. **Dipterocarpaceae**. Resinous trees. L. alternate, usually coriaceous, simple, penninerved; stipules large, enclosing the bud. Fl. bisexual, regular, calyx-segments 5, some or all as a rule much enlarged in fr. Petals 5, contorted; stamens 5, 10, or more, anthers adnate to filaments. Fruit indehiscent, 1-seeded.

22. **Ancistrocladaceae**. Glabrous, woody climbers, not resinous. L. entire, stipules minute, caducous. Fl. bisexual, regular, pentamerous, calyx adnate to the 1-celled ovary, segments much enlarged in fr.

23. **Malvaceae**. Wood soft and light. L. alternate, mostly stipulate, generally palminerved, hairs usually stellate. Fl. as a rule bisexual, regular, supported by 3 or more bracteoles. Sepals 5, valvate, more or less connate, petals 5, base adnate to staminal-column, contorted in bud. Stamens numerous; filaments variously connate; anthers 1-celled.

24. **Sterculiaceae**. L. alternate, mostly stipulate, hairs often stellate. Sepals 5, valvate, more or less connate, petals 5 or none. Stamens commonly monadelphous, anthers 2-celled. Fr. a dehiscent capsule or a whorl of distinct carpels.

25. **Tiliaceae**. L. alternate, simple, stipules deciduous. Fl. regular, almost always bisexual. Sepals 5, usually connate, valvate in bud. Stamens numerous, anthers 2-celled. Ovary 2-10-celled.

26. **Elæocarpaceae**. Trees. Leaves simple. Flowers usually hermaphrodite, rarely polygamous, in axillary racemes. Sepals 5, distinct. Petals 5, often 5-lobed torus. Stamens usually indefinite, never less than 10. Ovary sessile, 2-5-celled. Seeds pendulous.

2. DISCIFLORÆ.

27. **Linaceae**. Shrubs. Leaves alternate, glabrous, stipules minute. Flowers yellow, regular, bisexual. Sepals and petals 5 each, free. Stamens 5, connate at the base with small interposed staminodes. Disk inconspicuous of 2-3

glands adnate to the staminal-tube. Ovary 3-5-celled, cells spuriously 2-locellate. Fruit a capsule.

28. *Malpighiaceæ*. L. usually opposite, simple, entire, stipules small or 0. Fl. often zygomorphic, calyx 5-lobed, petals 5, often fimbriate. Stamens 10, sometimes unequal. Fr. usually of one or more winged samaras.

29. *Oxalidaceæ*. Generally herbs or undershrubs, rarely trees. Leaves alternate, compound. Flowers regular. Fruit a loculicidal capsule or a 5-lobed berry.

30. *Rutaceæ*. L. aromatic, dotted with translucent glands, stipules 0. Fl. regular, sepals and petals 4 or 5, stamens 4-5 or 8-10, filaments inserted on the outside of the disk.

31. *Simarubaceæ*. Bark bitter. L. alternate, stipules deciduous or 0. Fl. regular, small, often unisexual, sepals 3-5, usually connate, petals 3-5. Stamens as many as petals or double their number, inserted outside the disk.

32. *Ochnaceæ*. L. alternate, simple, glabrous, stipulate. Fl. regular, bisexual. Sepals 4 or 5, free, imbricate, persisting, petals 5 or more, deciduous, stamens 10 or many, anthers basifixed. Fr. of 3-10 one or few-seeded drupes.

33. *Burseraceæ*. Resinous. L. alternate, imparipinnate, sometimes 1-foliolate. Fl. small, regular, calyx 3-5-lobed, petals 3-5. Stamens as many as petals or twice their number, inserted on the disk or outside at its base. Ovary 2-5 celled, ovules 2 in each cell.

34. *Meliaceæ*. L. alternate, generally pinnate, stipules 0. Fl. regular, in cymose panicles, calyx small, 4-5-cleft, petals 4-5, stamens twice the number of petals, filaments generally united into a tube, disk between stamens and ovary often tubular.

35. *Chailletiacææ*. L. alternate, entire, simple, stipules deciduous. Fl. 1-sexual or polygamous, petals 5, notched or bifid; stamens 5, disk of 5 glands, alternating with stamens. Ovary pubescent, 2-3-celled, ovules 2, collateral in each cell. Endosperm 0; cotyledons thick.

36. *Oleaceæ*. L. alternate, stipules 0. Fl. small, as a rule bisexual, calyx small or wanting, stamens opposite of petals or many. Ovary at base often 2-5-celled, ovules from a free axile placenta. Drupe 1-seeded.

37. *Icacinaceæ*. L. generally alternate, stipules 0. Fl. small, 1-sexual or polygamous, calyx small or wanting, stamens alternating with petals. Ovary 1-celled. Drupe 1-seeded.

38. **Aquifoliaceæ.** L. alternate, simple, usually coriaceous and evergreen, stipules minute. Fl. regular, usually 1-sexual, calyx 4-5-lobed, petals 4-5, connate at base. Stamens 4-5, alternating with petals, disk 0. Fr. a drupe, supported by the persistent calyx, stones 1-seeded, 2 or more.

39. **Celastraceæ.** L. simple, as a rule opposite, stipules minute or none. Fl. regular, small, bisexual or polygamous, calyx small, 4 or 5-lobed, persistent. Disk large, surrounding the base of the 3-5-celled ovary or partially enclosing it, stamens 3-5, rarely 10, inserted on the disk.

40. **Hippocrateaceæ.** Small trees or scandent shrubs. Leaves opposite, petioled; stipules small, caducous. Flowers small, white or greenish. Fruit of 3-flattened carpels connate at the base, usually dehiscent. Seeds compressed.

41. **Rhamnaceæ.** Branchlets or stipules often spinescent. L. simple. Fl. small, regular, calyx 4-5-cleft, lobes triangular, valvate in bud, disk lining or filling the calyx-tube, petals inserted at the mouth of calyx-tube. Stamens opposite to petals, often enclosed by them.

42. **Ampelidaceæ.** Climbers. L. alternate, often compound. Fl. regular, calyx small, entire or 4-5-dentate; petals 4-5, valvate in bud. Stamens opposite of petals, inserted outside or between the lobes of the disk. Fr. a berry.

43. **Staphyleaceæ.** L. opposite, stipulate, compound, leaflets stipellate. Fl. regular, bisexual, pentamerous, stamens 5, inserted outside the disk. Ovary 3-celled.

44. **Aceraceæ.** L. opposite, stipules 0. Fl. regular, polygamous, calyx 5-12-parted, deciduous. Stamens generally 8, inserted outside or upon (rarely inside) the disk. Fruiting carpels winged.

45. **Sapindaceæ.** L. alternate (opposite in *Æsculus*), stipules 0. Fl. sometimes zygomorphic, mostly polygamous. Stamens inserted between disk and ovary, filaments usually hairy, disk frequently unilateral. Ovary 3-celled, often 3-lobed.

46. **Sabiaceæ.** L. alternate, stipules 0. Fl. small, calyx 4-5-partite, stamens 4-5, opposite to petals, anther-cells distinct, usually adnate to a large connective.

47. **Anacardiaceæ.** L. in most genera alternate, stipules 0. Fl. regular, calyx 3-5-cleft (spathaceous in *Gluta*), petals 3-5, rarely 0. Stamens alternating with petals, inserted under, rarely on the disk. Ovary in 2 genera inferior, drupe 2-5-seeded.

48. **Moringaceæ.** Wood soft. L. deciduous, alternate, bi- or tri-pinnate, pinnæ and leaflets opposite, glands at base of petioles and pinnæ. Fl. large, bisexual, pentamerous, petals unequal. Fertile stamens 5, opposite to petals alternating with sterile stamens. Fr. a long 1-celled 3-valved pod.

3. CALYCIFLOREÆ.

49. **Connaraceæ.** L. alternate, imparipinnate or 1-foliolate, leaflets entire, coriaceous, stipules 0. Fl. usually bisexual and regular, pentamerous, petals linear-oblong, stamens 10, the epipetalous stamens generally shorter and often sterile. Carpels 5, free, mostly hairy, ovules 2, collateral. Fruiting carpel one, 2-valved.

50. **Leguminosæ.** L. stipulate, as a rule alternate and compound. Fl. bisexual, petals 5, in the majority of genera zygomorphic, stamens 10 or many. Carpel one, free, ovules usually numerous, attached to the inner suture. Fr. a 1-celled pod, endosperm generally 0.

51. **Rosaceæ.** L. stipulate, usually alternate. Fl. pentamerous, as a rule regular and bisexual, stamens usually numerous. Carpels mostly distinct, often adnate to and enclosed in the calyx-tube albumen 0 or scanty.

52. **Saxifragaceæ.** L. simple. Fl. regular, 4- or 5-merous, calyx free or adnate to ovary, stamens free, as many as petals, twice the number or numerous. Carpels 2 or numerous, usually connate, ovules numerous. Seeds small, embryo minute, in copious albumen.

53. **Droseraceæ.** Perennial herbs. Leaves rosulate or alternate, usually circinate in veneration. Calyx free from the ovary. Petals 4-8. Stamens as many as the petals. Capsule loculicidally 2-5 valved. Seeds numerous.

54. **Hamamelidaceæ.** L. alternate, stipules usually deciduous. Fl. in compact heads or spikes, usually bracteate, calyx-tube more or less adnate to ovary. Ovary 2-celled, styles 2, usually persistent. Testa shining.

55. **Rhizophoraceæ.** L. opposite, usually coriaceous and entire, scars of petioles mostly prominent, stipules interpetiolar, deciduous. Fl. regular, generally bisexual, calyx more or less adnate to ovary, limb 4-14-lobed, lobes as a rule persistent, petals as many as sepals, stamens usually twice the number of petals. Fr. coriaceous, usually 1-seeded.

56. **Combretaceæ.** L. simple, entire, stipules 0. Fl. usually bisexual and regular, calyx-tube adnate to ovary

and produced beyond it, segments 4-5, valvate, petals often wanting. Stamens as many as calyx-segments or twice their number, perigynous. Fr. generally angled or winged.

57. **Myrtaceæ.** L. simple, generally quite entire, either opposite with translucent glands or alternate without glands. Stipules 0. Fl. regular, generally bisexual. Ovary enclosed in and generally adnate to calyx-tube. Stamens many, inserted with the petals in the mouth of calyx-tube.

58. **Lecythidaceæ.** Usually trees. Leaves alternate not gland dotted, entire or toothed. Flowers regular, 2-sexual. Calyx-tube adnate to the ovary; lobes usually 1-6, valvate or imbricate. Petals usually 4-6. Stamens numerous, in many series, few sometimes sterile. Ovary inferior, 2-6, rarely more celled. Fruit indehiscent, usually a woody, fleshy or fibrous berry.

59. **Melastomaceæ.** Herbs or shrubs. Leaves opposite, simple, exstipulate. Flowers regular, showy, 4-5-merous. Calyx-tube partially adnate to the ovary. Petals free. Stamens twice as many as the petals; anthers longer than the filaments, curved, opening by apical pores. Ovary usually 4-celled. Fruit a capsule. Seeds many, minute.

60. **Lythraceæ.** L. generally opposite, simple, entire, calyx cup-shaped, persistent, segments valvate, often with intermediate teeth, petals when present imbricate and crumpled in bud. Ovary as a rule superior.

61. **Onagraceæ.** Herbs or undershrubs, sometimes aquatic. Flowers usually regular, 2 sexual. Calyx adnate or $\frac{1}{2}$ -adnate to the ovary (Trapa); lobes 2-5, usually 4, valvate. Petals alternating with sepals, rarely 0. Stamens as many or twice as many as the sepals. Ovary usually 2-4-celled. Fruit capsular and many seeded or indehiscent and 1-seeded (Trapa).

62. **Passifloraceæ.** L. alternate, usually lobed. Fl. regular, unisexual in Papaya, bisexual in Passiflora.

63. **Cucurbitaceæ.** Large climbing herbs. Leaves petioled, cordate, ovate, 5-angular or lobed. Flowers monœcious, all solitary, yellow, very large. Fruit fleshy, indehiscent, often large. Seeds ovoid or oblong.

64. **Begoniaceæ.** Flowers not symmetrical; stamens numerous, free or conjoined, anthers ovoid; placentas projecting from inner angle into carpellary chamber; styles free or only united at base; herbs or shrubs with more or less succulent leaves and stems.

65. **Datisceae**. L. deciduous, petiolate, broadly ovate. Fl. dioecious, male flowers-calyx deeply 4-lobed, petals 0, stamens 4. Capsule crowned by the persistent calyx-segments, the valves terminating in the persistent styles.

66. **Cactaceae**. Stems and branches succulent, prickly. Fl. regular, bisexual, solitary, calyx-tube adnate to ovary, petals numerous, imbricate, stamens many. Fr. fleshy, seeds numerous.

67. **Umbelliferae**. Herbs; fruit dry separating spontaneously into two dry indehiscent carpels with usually glandular vittae containing an essential oil.

68. **Araliaceae**. L. alternate, simple or compound. Fl. regular, usually pentamerous and umbellate. Calyx adnate to ovary, usually entire, petals caducous. Stamens inserted outside the epigynous disk, anthers didymous.

69. **Cornaceae**. L. entire, stipules 0. Fl. regular, calyx-tube adnate to ovary, limb persistent, segments small, petals 4 or 5, inserted with stamens round an epigynous disk. Fr. drupaceous.

ii. Gamopetalae.

70. **Caprifoliaceae**. L. opposite, stipules usually 0. Fl. bisexual, calyx-tube adnate to ovary, limb 3-5-toothed, corolla often zygomorphic, lobes 5. Stamens inserted on the corolla-tube.

71. **Rubiaceae**. L. opposite, sometimes whorled, stipules as a rule interpetiolar. Fl. as a rule bisexual and regular, calyx-tube adnate to ovary, corolla inserted round the epigynous disk, stamens inserted on the corolla-tube, alternating with its lobes. Ovary as a rule 2-celled.

72. **Valerianaceae**. Herbs or shrubs. Leaves opposite, exstipulate. Flowers sessile, cymose, sometimes polygamous or dioecious, bracteate. Stamens 1-4, on the corolla-tube. Fruit indehiscent, dry, 1-seeded. Seed pendulous.

73. **Dipsaceae**. Herbs or rarely shrubs. Leaves opposite or whorled, exstipulate, sometimes connate at the base, entire, toothed. Flowers scattered in cymes, whorled in spikes. Stamens 4 or 2. Seed pendulous, albumen copious.

74. **Compositae**. L. as a rule alternate, stipules 0. Inflorescence a dense head of many small fl., sessile on a broad receptacle and enclosed in an involucre of whorled or imbricate bracts. Calyx usually a pappus of hairs on the top of the ovary, stamens on the corolla-tube, anthers usually connate, connective produced upwards.

75. **Campanulaceæ.** Herbs or undershrubs, sometimes twining. Leaves alternate or opposite, entire, toothed or rarely lobed; stipules 0. Inflorescence axillary or terminal. Stamens 4-6, alternating with the corolla-lobes. Fruit capsular. Seeds very many.

76. **Vacciniaceæ.** Shrub or small trees. Leaves alternate or falsely whorled, entire or serrate; stipules 0. Flowers racemose or axillary and solitary. Stamens 10. Fruit a berry, rarely dry, 5-or falsely 10-celled. Seeds many, albuminous.

77. **Ericaceæ.** L. alternate, simple, stipules 0. Fl. bisexual, 4-or 5-merous, stamens as a rule twice the number of corolla-lobes, anther-cells opening at the top by pores or short slits. Ovary inferior or superior, 4-5-or many-celled, ovules numerous on an axile placenta.

78. **Plumbaginaceæ.** Herbs or undershrubs. Flowers in terminal scapes or peduncles, capitate, racemed or paniced. Petals 5. Stamens 5, opposite the petals, filaments rarely united into a linear tube. Stamens 5, opposite the petals. Capsule membranous.

79. **Primulaceæ.** Perennial, rarely annual herbs. Leaves all radical, or if cauline opposite, alternate or whorled, exstipulate. Flowers hermaphrodite, regular. Stamens on the corolla-tube, opposite its lobes. Capsule dehiscent transversely or by valves. Seeds minute, usually angular.

80. **Myrsinaceæ.** L. alternate, simple, gland-dotted, stipules 0. Calyx persistent, often enlarged in fr. Corolla-tube short or none, stamens opposite the corolla-segments. Ovary 1-celled, ovules on a free central placenta.

81. **Sapotaceæ.** L. entire, usually alternate and coriaceous. Fl. bisexual, calyx persistent, segments 4-8, almost distinct, corolla-tube short, lobes 4-24. Fr. a 1-8-seeded berry, seeds oily, with a crustaceous shining testa.

82. **Ebenaceæ.** L. entire, as a rule alternate, stipules 0. Fl. regular, usually dioecious, calyx gamosepalous, persistent and generally enlarged in fr.; segments 3-6, corolla-segments 3-6, stamens usually twice the number of corolla-lobes, filaments variously connate at base, often in pairs, anthers basifixed. Rind of fr. coriaceous, seeds embedded in soft or viscid pulp.

83. **Styraceæ.** L. alternate, stip. 0. Fl. bisexual, regular, 4-5-merous, calyx superior or inferior, limb persistent, petals free or connate, stamens 10 or numerous. Ovary 2-5-celled, ovules 1 or few on the inner angle.

84. **Oleaceæ.** L. as a rule opposite, stip. 0. Fl. regular, as a rule bisexual, in trichotomous panicles, calyx small, often truncate. Stamens 2, filaments usually short, ovary free, 2-celled, ovules 1 or 2 in each cell.

85. **Apocynaceæ.** L. entire, as a rule opposite or whorled, stipules 0 or small, sometimes intrapetiolar. Fl. regular, bisexual, usually pentamerous. Calyx free, corolla-lobes spreading, mostly contorted in bud, stamens 5, inserted in the corolla-tube. Carpels 2, usually distinct. Seeds often with a tuft of hairs. Endosperm scanty.

86. **Asclepiadaceæ.** L. entire, as a rule opposite, stipules 0. Fl. regular, bisexual, pentamerous. Calyx inferior, sepals imbricate in bud. Stamens 5, inserted on the base of the corolla, anthers cohering or connate, enclosing the stigma, pollen-grains as a rule united into waxy masses. Corona corolline or staminal. Carpels 2, distinct. Seeds usually winged and surmounted by a dense brush of hairs. Embryo large, in copious endosperm.

87. **Loganiaceæ.** L. opposite, simple, generally connected by interpetiolar stipules or by a raised line. Fl. regular, usually bisexual, ovary free, 2-celled. Embryo straight, in copious endosperm.

88. **Gentianaceæ.** Herbs, rarely minutely hairy. Leaves opposite, rarely alternate, entire, or alternate and 3-foliate in Menyanthes. Fl. cymose, capitate or umbelled, rarely solitary, regular. Stamens on the corolla-tube, as many as its lobes; filaments linear. Capsule membranous, rarely fleshy and berried. Seeds numerous, small.

89. **Polemoniaceæ.** Herbs, shrubs, or trees. Leaves exstipulate. Flowers showy, regular, hermaphrodite, 5-merous. Calyx inferior. Stamens 5, on the corolla-tube, alternate with its lobes. Capsule septicidal, 3-valved. Seeds many, albuminous; embryo straight.

90. **Hydrophyllaceæ.** Herbs, rarely shrubs, usually hairy, sometimes glandular hairy. Leaves simple or compound, exstipulate, usually alternate, rarely opposite. Flowers bisexual, regular, usually 5-merous. Fruit usually a loculicidal capsule. Seeds minute, embryo small.

91. **Boraginaceæ.** L. as a rule alternate and simple, stipules 0. Fl. bisexual, as a rule regular and pentamerous, in unilateral spikes or racemes, calyx free, persistent, lobes valvate in bud. Ovary superior, cells 2, each with 2 ovules, or 4, each with one ovule. Fr. a drupe or consisting of 4 nutlets.

92. **Convolvulaceæ.** L. alternate, stipules 0. Fl. large, bisexual, regular, pentamerous, sepals distinct, persistent. Fr. a berry or capsule, seeds 2-4.

93. **Solanaceæ.** L. as a rule alternate, stipules 0. Fl. regular, pentamerous, calyx usually gamosepalous, ovary free. Fr. a berry or capsule, seeds numerous.

94. **Scrophulariaceæ.** L. usually opposite, stip. 0. Fl. usually bisexual, corolla bilabiate, stamens 4, didynamous. Fr. a capsule, seeds numerous.

95. **Lentibulariaceæ.** Herbs, aquatic or in wet places. Leaves radical, rosulate, or capillary multifid or obsolete. Flowers hermaphrodite, purple, yellow, or white. Stamens 2, attached to the base of the corolla. Capsule globose, 2-4 valved. Seeds numerous, small.

96. **Gesneraceæ.** Herbs or undershrubs. Leaves opposite, alternate or solitary, undivided, entire or toothed; stipules 0. Flowers hermaphrodite, rarely regular. Fruit capsular or berried, dehiscent or indehiscent. Seeds very many.

97. **Bignoniaceæ.** L. usually opposite, compound, leaflets opposite, stip. 0. Fl. bisexual, generally zygomorphic, calyx gamosepalous, truncate, split or toothed. Ovary free, supported by an annular disk. Fr. often elongated, generally dehiscent, the two valves separating from the dissepiment, to which numerous seeds are attached.

98. **Pedaliaceæ.** Herbs or undershrubs. Leaves opposite, or the upper alternate, entire, toothed or divided. Flowers irregular, axillary, solitary or rarely clustered. Stamens 4, didynamous; rarely 2. Capsule 2 or 3-4-celled. Seeds wingless, exalbuminous.

99. **Acanthaceæ.** L. opposite, stip. 0. Fl. bisexual, mostly irregular. Ovary free, 2-celled, style filiform, bifid, one branch often obsolete. Capsule loculicidal, seeds seated on hard curved acute supports.

100. **Verbenaceæ.** L. usually opposite or whorled, stip. 0. Fl. bisexual or by abortion polygamous, usually zygomorphic. Calyx as a rule gamosepalous and persistent, lobes imbricate, stamens usually 4, ovary 2-or 4-celled, 1 ovule in each cell.

101. **Labiataæ.** Mostly aromatic, branches usually 4-sided, L. opposite or whorled, stip. 0. Fl. zygomorphic, calyx persistent, corolla usually 2-lipped, lobes imbricate in bud. Stamens didynamous, the 2 upper sometimes imperfect or wanting. Ovary free, usually 4-lobed, supported by the annular disk. Fr. of 4 one-seeded nutlets.

102. **Plantaginaceæ.** Scapigerous herbs. Leaves usually radical. Flowers small, greenish, spicate, often dimorphic. Stamens 4, inserted on the corolla-tube; filaments capillary. Capsule 1-4-celled. Seed usually peltate, testa thin.

iii. Apetalæ.

103. **Nyctaginaceæ.** L. as a rule entire and opposite, stip. 0. Fl. usually bisexual, often involucrate, perianth small, petaloid. Ovary free, 1-celled, ovule 1. Fr. indehiscent, enclosed in the persistent perianth-tube.

104. **Amarantaceæ.** Stip. 0. Fl. usually bisexual, perianth of 5 persistent sepals, imbricate in bud. Stamens opposite the sepals, ovary free, 1-celled. Seed one, embryo horseshoe-shaped or annular, surrounding a mealy endosperm.

105. **Chenopodiaceæ.** L. alternate, rarely opposite, simple, stip. 0. Fl. small, perianth of 3-5 sepals, stamens opposite the sepals. Fr. generally enclosed in the perianth, seed one, embryo curved, annular or spiral.

106. **Phytolaccaceæ.** Glabrous trees, shrubs or herbs. Leaves alternate, quite entire, stipules small or 0. Flowers racemed, bracteate and 2-bracteolate. Stamens 4, alternate with the petals. Carpels 1 or more, superior, free or connate. Seeds erect, often arillate.

107. **Polygonaceæ.** L. alternate, simple, stipules scarious or membranous, usually sheathing. Fl. small, usually bisexual, perianth of 4-6 persistent segments, imbricate in bud, stamens opposite the segments. Ovary free, 1-celled, compressed or trigonous. Fr. a small hard nut, seed one.

108. **Podostemonaceæ.** Aquatics, growing on stones in tropical streams, annual or perennial. Flowers 1-sexual, rarely dioecious, usually enclosed in a spathe. Stamens definite or not, free or connate. Capsule 1-3-celled. Seeds minute; embryo straight.

109. **Nepenthaceæ.** Climbing or prostrate evergreen undershrubs. Leaves alternate, exstipulate, midrib stout. Stamens 4-16, united in a column crowned by the usually connate anthers with extrorse dehiscence. Capsule coriaceous. Seeds very numerous.

110. **Cytinaceæ.** Leafless brown reddish or yellowish parasites, or with leaves reduced to scales. Flowers solitary. Stamens 8 or more. Ovary 1-celled. Fruit fleshy, 1-celled. Seeds innumerable, very minute.

111. **Aristolochiaceæ.** L. alternate, stip. 0. Fl. bisexual, perianth campanulate or tubular, 3-lobed or 2-lipped, ovary inferior, placentas parietal, ovules numerous.

112. **Piperaceæ.** L. alternate, entire, basal nerves 3 or more, stipules membranous, enclosing the buds. Fl. usually dioecious or polygamous, in catkinlike spikes, perianth 0, stamens 1-4, hypogynous. Berry 1-celled, seed globose.

113. **Chloranthaceæ.** Herbs, shrubs or trees, usually aromatic. Leaves opposite, usually toothed, petioles often connate and forming a sheath. Flowers in terminal or pseudo-axillary spikes, heads or panicles, 1-sexual. Stamens 1 or 3 connate. Ovary 1-celled. Seed pendulous, testa membranous.

114. **Myristicaceæ.** Aromatic. L. entire, penninerved, stip. 0. Fl. 1-sexual, perianth as a rule 3-lobed, valvate in bud, anthers 6-30, usually sessile, ovary free, ovule 1, erect. Seed arillate, endosperm oily, ruminant.

115. **Lauraceæ.** Aromatic. L. as a rule entire and evergreen, stip. 0. Perianth regular, deeply 6-cleft, segments biseriate, tube often enlarged in fr., stamens perigynous, normally 12 in 4 circles, those of the innermost circle often wanting, those of the two outermost circles opposite to perianth-segments, anther-cells 2 or 4, opening by valves. Ovary free, 1-celled. Fr. a berry or drupe, seed one, cotyledons thick, oily.

116. **Hernandiaceæ.** L. alternate, stip. 0. Perianth of 4-10 segments, stamens 3-5, anther-cells 2, opening by valves.

117. **Proteaceæ.** L. hard, mostly alternate, stip. 0. Fl. bisexual, perianth of 4 segments, in bud valvately cohering into a cylindrical tube, tips free, recurved. Stamens 4, filaments inserted on perianth-segments. Ovary free, 1-celled. Seeds few.

118. **Thymelæaceæ.** L. simple, quite entire. Fl. usually bisexual, perianth tubular or campanulate, lobes 4 or 5, imbricate in bud. Stamens inserted on the perianth, usually twice the number of lobes. Ovary free, usually 1-celled.

119. **Elæagnaceæ.** Often spinescent, with silvery or brown stellate scales or hairs. L. alternate, quite entire, stip. 0. Fr. indehiscent, entirely enclosed within the lower fleshy part of perianth, seed 1, radicle inferior.

120. **Loranthaceæ.** Parasitic on stems and branches. L. entire, usually opposite, sometimes wanting. Fl. regular, perianth simple or double, stamens equal to and opposite

the petals or perianth-lobes. Ovary inferior, 1-celled, ovule 1, adnate all round to the ovary walls. Fr. usually viscid.

121. **Santalaceæ.** Mostly root-parasites. L. entire, stip. 0. Perianth usually adnate to ovary, 5-8-lobed, stamens opposite to lobes, ovary 1-celled, ovules several. Drupe or nut 1-seeded.

122. **Balanophoraceæ.** Flowers monœcious or diœcious, small or minute, crowded on spadix-like peduncled heads or cones. Stamens 1-2 in the naked flowers; in the flowers with a perianth as many as its lobes and opposite them or more, filaments 0. Fruit minute, crustaceous or coriaceous, 1-seeded. Seed usually adherent to the pericarp.

123. **Euphorbiaceæ.** L. in most genera alternate, undivided and stipulate. Fl. as a rule unisexual. Perianth calycine, several genera with petals. Ovary superior, as a rule of 3 carpels, more or less united, styles 3, ovules 1 or 2 in each cell, pendulous from the inner angle.

124. **Ulmaceæ.** L. distichous, undivided, stipulate. Perianth 4-9-lobed or of 4-5 sepals, stamens opposite to perianth-segments, rarely twice their number. Ovary of 2 carpels, usually 1-celled, ovule 1, pendulous.

125. **Moraceæ.** L. usually alternate, stipules large, often amplexicaul. Fl. unisexual, crowded on receptacles, which are globose, cylindric or hollow. Female flowers-perianth of 4 sepals or segments, often fleshy in fr. Ovary 1-celled, ovule 1, usually pendulous.

126. **Urticaceæ.** L. alternate, stipulate, as a rule dentate, basal n. 3. Fl. unisexual, sessile, usually in compact heads or clusters, stamens 4 or 5, opposite to perianth-segments, filaments inflexed in bud. Ovule erect, orthotropous.

127. **Juglandaceæ.** L. alternate, pinnate, stip. 0. Fl. monœcious; male flowers in lateral pendulous catkins. Female flowers in few-or many-fl. spikes, perianth adnate to the 1-celled ovary, ovule 1, erect. Cotyledons oily, endosperm 0.

128. **Myricaceæ.** Aromatic. L. alternate, coriaceous, stipules 0. Fl. unisexual, in catkins, stamens 3-6 in the axils of broad bracts. Fr. fleshy, endocarp bony, seed 1, endosperm 0.

129. **Fagaceæ.** L. alternate, simple, penninerved, stip. deciduous. Fl. monœcious, male flowers in drooping catkins or in erect spikes, anther-cells not distinct. Female flowers in spikes, each fl. or group of fl. enclosed in an involucre of numerous bracts, coalescing in fr., perianth adnate to ovary. Ovary 2-6-celled, 2 pendulous ovules in each cell.

130. **Betulaceæ.** L. alternate, undivided, as a rule serrate, stipules deciduous. Fl. early in spring, male fl. in drooping catkins, anther-cells as a rule distinct, female fl. in spikes, ovary 2-celled, 1 pendulous ovule in each cell, styles 2, long, filiform, perianth 0 or adnate to ovary.

131. **Salicaceæ.** L. deciduous, alternate, simple, stipulate. Fl. diœcious, in catkins similar in both sexes, 1 fl. in the axil of each bract, a disk at the base of stamens and ovary, perianth 0. Ovary 1-celled, ovules many on 2-4 parietal placentas. Seeds many, minute, enclosed by long silky, deciduous hairs.

b. Gymnosperms.

132. **Gnetaceæ.** Stem and branches jointed at the nodes. L. opposite or reduced to a short sometimes 3-4-dentate sheath. Fl. unisexual, ♀ one erect ovule, integument single, prolonged into a tube. ♂ Ovule enclosed in a perianth, which usually becomes fleshy in fr.

133. **Taxaceæ.** L. mostly narrow, linear or lanceolate. Fl. mostly diœcious. Carpels usually few or even 1 terminal, with 1-2 ovules each.

134. **Pinaceæ.** L. usually needl-like or scaly. Fl. mostly monœcious. Male flowers in deciduous catkin consisting of numerous sporophylls which are usually scale-like. Female flowers in cones consisting of scale-like open carpels which are flat or peltate.

135. **Cycadaceæ.** Trunk cylindric, sometimes branched, with terminal tufts of rigid, pinnate leaves, pith and bark large. Fl. diœcious, at the apex of trunk among the leaves, male fl. in erect cones with numerous thick scales, bearing on the under-surface many globose anther-cells. Female fl. carpophylls densely woolly in crowded whorls around the top of trunk, each with 1-5 pairs of ovules on its edge.

GLOSSARY

OF

BOTANIC TERMS.

A

- Abortion**, imperfect development or non-development of an organ;
abortive, obsolete; imperfectly developed.
- Accrescent**, increasing in size with age; usually said of parts of the calyx or corolla that persist and enlarge after flowering.
- Achene**, a small dry indehiscent 1-celled 1-seeded fruit or a 1-seeded indehiscent carpel of an apocarpous fruit.
- Acicular**, needle-shaped; long and slender.
- Acorn**, fruit of the oak. *i.e.*, a nut enclosed within a cup formed of an involucre of thickened bracts.
- Actinomorphic**, divisible into similar halves by two or more planes; said of flowers.
- Aculeate**, abounding with prickles.
- Acumen**, a sharp tapering point more or less prolonged.
Acuminate, terminating in an acumen.
- Acute**, evenly tapering and ending in a narrow angle, but without a prolongation.
- Adnate**, said of dissimilar organs when congenitally united.
- Adpressed**, lying close throughout the entire length against the surface.
- Adventitious**, occurring in an unusual position; usually applied to buds and roots.
- Æstivation**, the mode in which the parts of a flower are folded in the bud, also their relative position.
- Albumen**, the nutritive substance found within the seed coats of some seeds outside the embryo.
- Amplexicaul**, said of a sessile leaf or the base of a petiole when clasping the stem.
- Anastomosing**, reticulately united.
- Anatropous**, said of an inverted ovule, *i.e.*, one with the micropyle close to the hilum, and the chalaza at the opposite end, the axis of the ovule itself remaining straight.
- Androphore**, the tube or column on which some stamens are supported.
- Andrœcium**, the male organs of a flower collectively.
- Androgynous**, said of an inflorescence bearing both male and female flowers.

- Angiosperm**, a subphylum (which includes the two classes Monocotyledons and Dicotyledons) in which the ovules are enclosed in the ovary and are fertilized through the stigma.
- Annulate**, marked transversely by rings.
- Anterior**, said of that part of a flower which faces outwards from the axis of inflorescence; inferior.
- Anther**, the part of a stamen that bears the pollen.
- Antipetalous**, inserted opposite the petals.
- Apetalous**, without petals.
- Apiculate**, with a short pointed tip.
- Arborescent**, tree-like, growing to the size of a tree.
- Apocarpous**, with the carpels free and distinct.
- Arcuate**, shaped like a bow, *i.e.*, moderately curved.
- Areola**, a small space with clearly defined outline *e.g.*, the spaces between the reticulating veinlets of a leaf.
- Aril**, **arillus**, an accessory seed-covering or an appendage growing from or about the hilum of a seed. **Arillate**, having an aril.
- Arillode**, a false aril growing from the micropylar end.
- Aristate**, bearing an awn, or bristle *e.g.*, glumes of some grasses.
- Articulate**, jointed in such a manner as to separate at maturity.
- Ascidium**, a pitcher-like cavity formed by a modification of the leaf stalk or blade.
- Ascending**, directed obliquely upward.
- Attenuate**, narrow and gradually tapering.
- Auricle**, an appendage like the lobe of an ear. **Auriculate**, **auricled**; having an auricle.
- Awn**, a bristle-like appendage, especially of the glumes of grasses.
- Axil**, the upper angle formed by a leaf or a similar organ and the supporting stem or axis. **Axillary**, relating to the axil.
- Axile**, relating to the axis; generally said of a kind of placentation in which the ovules are borne on the axis at the inner angles of the cells of a syncarpous ovary.
- Axis**, the central line or support round or on which parts of an organ are arranged.

B

- Baccate**, berry-like, pulpy.
- Basifixed**, fixed by the base, especially said of an anther attached at its lower end to the top of the filament; innate. **Basal**, **basilar** attached to the base.
- Bast**, fibrous inner bark.
- Beak**, a sharp tip like the bill of a bird.
- Berry**, a simple fruit succulent throughout, without a stone, and generally with more than one seed.
- Bifarious**, in two opposite vertical rows.
- Bifid**, divided into two segments with a narrow sinus.
- Bifurcate**, two-forked, having two prongs or branches.
- Bilabiate**, having two lips, a term usually applied to gamosepalous calyces and gamopetalous corollas.

Bipinnate, twice pinnate.

Biseriate, in two series or rows, generally one above or within the other.

Bisexual, having both stamens and pistil in the same flower; hermaphrodite.

Biternate, twice ternate.

Blade, the expanded portion of a leaf or a clawed petal.

Bole, the main axis or trunk of a tree.

Brachiate, widely spreading, a term applied to branches.

Bract, a rudimentary or modified leaf subtending a flower or an inflorescence. **Bracteate**, having bracts.

Bracteole, a secondary bract or one of the ultimate grade subtending each flower of an inflorescence. **Bracteolate**, having bracteoles.

Bulb, a short, usually underground stem, consisting of a short axis, bearing a bud or buds enclosed in fleshy scales or coats.

Bulbiform, formed like a bulb. **Bulbous**, of the nature of

bulbs. **Bulbil**, small axillary bulbs.

Buttressed, said of stems with vertical ridges or projections.

C

Caducous, falling off very early.

Caspirose, tufted or growing in tufts, e.g., many species of bamboos.

Callus, the new tissue which forms over the wounds of plants.

Calyx, the outer whorl of floral leaves, immediately below or outside the corolla. **Calyceine**, relating to the calyx.

Calyptra, a cap or hood. **Calyptrate**, hooded.

Cambiumlayer, a zone of tender thin-walled cells separating the wood from the bark in Dicotyledons and Gymnosperms, by the division and growth of which new wood and bark are formed.

Campanulate, bell-shaped—deeper than cupshaped.

Canescent, with very short grey hairs or pubescence giving the epidermis a greyish white hue.

Capillary, slender, hairy or thread-like.

Capitate, having a globose head.

Capitulum, a globose head or cluster or sessile or shortly pedicellate flowers.

Capsule, a dry syncarpous fruit, which opens at maturity to discharge the seed.

Carpel, one of the component parts of a syncarpous or apocarpous pistil. **Carpellary**, relating to a carpel.

Carpophore, the part of the axis of a flower situated between or above the Carpels, and to which the Carpels are attached.

Caruncle, a wart-like appendage, produced at the base of a seed.

Cartilaginous, firm and tough, like parchment.

Caryopsis, a grain; the seed-like fruit of Gramineæ with thin pericarp, which is usually adnate to the contained seed.

Catkin, a scaly spike or raceme of unisexual flowers, pendulous or drooping, and generally deciduous.

- Caudate**, furnished with a tail, or with a slender tail-like terminal appendage.
- Cauline**, pertaining to the stem.
- Cell**, the living vegetable unit; the structural unit in the formation of a plant. Also one of the cavities of an ovary or of an anther.
- Chalaza**, that part of the ovule where the base of the nucellus is confluent with the coats of the ovule.
- Chartaceous**, having the texture of writing paper, thin and flexible.
- Cilia**, marginal hairs forming a fringe like eye-lashes.
- Ciliate**, having cilia; dim. **ciliolate**.
- Circinate**, coiled inwards from the tip.
- Cirrhose**, bearing tendrils.
- Circumsciss**, dividing or opening circularly or transversely.
- Cladode**, a branch more or less flattened which assumes the form and functions of a leaf.
- Clavate**, club-shaped, slender below and gradually thickened upwards.
- Claw**, the narrowed base of certain petals.
- Cocci**, pl. of **coccus**, the seed-like dehiscent or indehiscent segments of the dry fruit which separate at maturity.
- Cogener**, one of the same genus.
- Coherent**, similar parts united together but separable without rupture.
- Collateral**, side by side.
- Coma**, a tuft of soft hairs or cotton borne on a seed. **Comose**, having a coma.
- Commissure**, the union line between two parts.
- Concolor**, **Concolorus**, of the same colour throughout.
- Confluent**, blending together.
- Conduplicate**, folded once upon itself lengthwise.
- Cone**, the multiple fruit of Conifers forms mostly of imbricated scales by which the seeds are subtended.
- Connate**, said of similar organs or parts of the same organ when congenitally united.
- Connective**, the portion of a stamen that connects the two lobes or cells of an anther.
- Connivent**, **conniving**, said of sepals, petals or anthers having the apex arching over or converging in the centre of the flower.
- Contorted**, **convolute**, twisted in one direction upon itself; said of leaves or petals in a bud with one margin within and the other outside the whorl.
- Convergent**, said of lateral nerves of leaves curved from base to apex.
- Cordate**, heart-shaped; when applied to the base of a leaf or other organ—with two broad rounded lobes on either side of the axis.
- Coriaceous**, leathery, tough and thick.
- Corm**, a solid fleshy underground stem more or less jointed and naked or with thin scales, such as is characteristic of certain families, e.g., Aroidæ.
- Corolla**, the inner whorl of floral leaves.

- Corona**, a whorl of process from the corolla, or from stamens in some families like Asclepiadaceæ.
- Cortical**, relating to the cortex or bark.
- Corymb**, an inflorescence of the indefinite or centripetal kind in which the lower branches or pedicels, are longer than the upper, and thus although starting from different points, all attain almost the same level.
- Costate**, furnished with one or more primary ribs or veins.
- Cotyledons**, the seed lobes or first leaves of an embryo.
- Crateriform**, shaped like a shallow cup.
- Crenate**, with rounded teeth.
- Crustaceous**, hard and brittle; said of a covering which splits and breaks off easily.
- Cruciform**, in the form of a cross; generally said of flowers with four petals arranged crosswise.
- Culm**, the hollow and jointed stem of grasses, especially of bamboos.
- Cuneate**, wedge-shaped, acute angled at the base.
- Cupula**, **cupule**, a cup-like involucre of thickened bracts supporting the nut of the oak.
- Cupular**, cup-shaped.
- Cusp**, a long and tapering rigid point. **Cuspidate**, furnished with a cusp.
- Cuticle**, the outermost layer of the epidermis.
- Cyathiform**, wine-cup shaped.
- Cyme**, an inflorescence of the definite or centrifugal type in which the main axis and all the lateral axis are each terminated by a flower so that flowering proceeds from the centre outwards.
- Cypsela**, a dry inferior achene invested with the adnate calyx; the fruit of Compositæ.
- Cystolith**, a crystalline concretion usually of calcium carbonate in the cells of some plants.

D

- Decandrous**, with ten stamens.
- Deciduous**, said of trees or shrubs which are leafless for a part of the year; also of leaf or parts of a flower which fall off normally.
- Declinate**, bent to one side.
- Decomound**, compound or divided more than once.
- Decumbent**, inclined downwards but with the tip ascending.
- Decurrent**, produced down, as a sessile leaf when the blade is prolonged below the insertion along the stem forming a winged appendage.
- Decurved**, bent or directed outwards.
- Decussate**, in pairs alternately crossing at right angles.
- Deflexed**, bent downward.
- Dehiscence**, the mode of opening of a capsule or of an anther.
- Deltoid**, triangular in outline or in section.
- Dentate**, with margins cut into triangular salient teeth directed outward. **Denticulate**, minutely toothed.

Dextrorse, turning or twining from left to right, *i.e.*, in the anti-clockwise direction.

Di, Dis (prefix), two, twice, double.

Diadelphous, said of stamens united by their filaments into two sets of bundles.

Dichasium, a falsely dichotomous cyme of which the main axis ends in a flower and branches below the latter into two lateral axes of almost equal strength.

Diclinous, having the stamens in one flower and the pistil in the other.

Didymous, slightly 2 lobed or occurring in pairs.

Didynamous, said of a flower with two long and two short stamens, and also of stamens when they are such.

Diffuse, widely spreading;—stems, procumbent and also very much loosely branched.

Digitate, finger-like; said of a compound leaf with the leaflets all borne on the apex of the common petiole.

Dimorphic, dimorphous, having two forms, generally said of hermaphrodite flowers having one form with long styles and short stamens, and another with short styles and long stamens.

Diœcious, unisexual with the male and female flowers on separate individuals.

Disk, Disc, an enlargement of the receptacle of a flower in the form of a cup or of a cushion, ring or glands. **Discoid, disciform**, disk-like; circular and flat. **Disc-florets**, those borne on the central portion of a capitulum.

Dissepiment, a partition in an ovary or pericarp in the direction of its length.

Distal, furthest from the base.

Distichous, arranged in two opposite vertical rows.

Divaricate, spreading widely apart.

Dorsal, relating to, or inserted on, the back.

Dorsifixed, said of an anther attached to the top of the filament by a part not the whole of the back.

Drupe, a stone fruit, *i.e.*, one with a fleshy or pulpy pericarp and a bony or crustaceous endocarp. **Drupaceous**, like a drupe.

Drupelet, drupel, a diminutive drupe.

E

E, Ex, (prefix), without or out of.

Ebracteate, without bracts. **Ebracteolate**, without bracteoles.

Echinate, set all round with sharp bristles like a hedge hog.

Effuse, very widely spreading.

Elliptic, elliptical, oblong with rounded ends. **Ellipsoid**, a solid with an elliptical outline.

Emarginate, with a notch at the apex.

Embryo, the rudimentary plantlet formed in a seed.

Endocarp, the inner layer of the pericarp.

- Endosperm**, the albumen of a seed.
Ensiform, in the shape of a sword.
Epi (prefix) upon.
Epicalyx, a whorl of bracts below the calyx proper and somewhat resembling it in shape and colour.
Epicarp, the outer layer of a pericarp.
Epidermis, the outermost layer of tissue or skin of a plant.
Epigynous, inserted on the top of the ovary.
Epipetalous, said of stamens which are borne on, or adnate to the petals or corolla.
Epiphyllous, growing on leaves or perianths.
Epiphyte, a plant growing on, but not nourished by another plant.
Epiphytic, having the habit of an epiphyte.
Equitant, said of two ranked leaves, or leaves in bud, when folded lengthwise, the outer ones at their base folding over the inner.
Erose, with an irregularly toothed margin.
Exalbuminous, without albumen.
Excavate, hollowed into broad deep pits.
Exocarp, the external layer of the pericarp when an endocarp is present.
Exserted, projecting outwards as anthers beyond the corolla.
Exstipulate, without stipules.
Extra-axillary, growing outside the axil, *i.e.*, above, below or one side of it.
Extrorse, applied to anthers that dehisce outwards, *i.e.*, away from the axis of the flower.

F

- Falcate**, curved like the blade of a sickle or scythe.
Family, a group of co-related genera.
Farina, starch or anything resembling it or analogous to it.
Farinaceous, consisting of or resembling starch.
Fascicled, fasciculate, in dense clusters.
Fastigate, said of branches which are nearly parallel and point upwards.
Ferruginous, coloured like iron rust.
Fibro-vascular, said of a tissue consisting of woody fibres and ducts or vessels.
Filament, the stock of an anther.
Filiform, thread-like.
Fimbriate, having a fringe or border of fine thread-like processes.
Fistular, hollow tubular.
Flabellate, fan-shaped.
Flaccid, soft, flabby, wanting in stiffness.
Floccose, woolly with locks of dense soft hairs that are easily detached.
Foliateous, of the form or texture of a leaf.
Follicle, a dry fruit resulting from a single carpel opening by only

one usually the inner suture. **Follicular**, pertaining to or resembling a follicle.

Foramen, the minute aperture in the coats of an ovule corresponding to the micropyle of a seed.

Free, distinct, not adnate to any other organ. **Free central**, said of the placenta of an one-celled ovary when it forms a central ovule bearing column arising from the base.

Fugacious, falling off or fading very early.

Fulvous, tawny.

Funicle, the stalk of an ovule or seed.

Furcate, forked.

Fuscous, brown or greyish brown.

Fusiform, spindle-shaped; solid and tapering at both ends.

G

Gamopetalous, having combined petals.

Gamophyllous, said of a flower having a perianth of united leaves or segments; also applied to such a perianth.

Gamosepalous, having combined sepals.

Geminate, growing in pairs.

Geniculate, bent abruptly.

Genus, pl. **genera**, a group of closely related species indicated by the first name of a plant.

Gibbous, having a pouch-like swelling or protuberance on one side.

Glabrous, without hairs of any kind. **Glabrate**, somewhat glabrous.

Glabrescent, becoming glabrous.

Glands, small wart-like bodies or round excrescences of any kind found on stems, petioles, etc., or inside flowers. Small raised superficial dots, or minute vesicles imbedded in the substance of leaves, etc., usually filled with oil. **Glandular**, having glands or relating to glands.

Glaucous, of a bluish-grey colour, often covered with a fine bloom.

Globose, nearly spherical.

Glochidia, barbed bristles.

Glomerate, compactly clustered.

Glumes, the chaffy bract-like scales of the inflorescence of grasses and their allies. **Glumaceous**, resembling or relating to glumes.

Glutinous, sticky.

Gonophore, a stipe or stalk supporting both stamens and ovary in a flower.

Gymnosperm, with naked seeds, i.e., not enclosed in a seed-vessel: a group comprising the Fir, Gnetum and Cycas families, the naked seeds of which are fertilised by direct contact with the pollen; see angiosperm.

Gynobase, a short and broad elongation of the torus on which the pistil rests. **Gynobasic**, resting on a gynobase.

Gynophore, the stipe or stalk supporting an ovary.

H

- Hastate**, spear-head shaped, usually said of leaves with a pointed apex, and basal lobes directed outwards.
- Haustorium**, pl. **haustoria**, a sucker at the end of a parasitic root; a root-like sucker.
- Head**, a form of inflorescence consisting of a more or less dense cluster of sessile flowers which are centripetal in evolution.
- Helicoid**, coiled in a spiral.
- Hermaphrodite**, bisexual; having both stamens and pistil in the same flower.
- Heter**, **hetero**, (prefix) different.
- Heterogamous**, said of flower heads when male, female, bisexual and neuter florets, or any two or three of these, are borne on the same head.
- Hilum**, the place of attachment of an ovule or seed to the placenta or funicle.
- Hirsute**, thickly covered with long and rather coarse hairs.
- Hispid**, beset with rigid or bristly hairs.
- Homogamous**, said of a flower head with the florets all of the same sex.
- Hyaline**, transparent or translucent and colourless.
- Hypanthium**, an enlargement of the torus of the flower under the calyx or perianth.
- Hypocrateriform**, salver-shaped; said of a corolla with a slender tube abruptly expanded into a flat horizontal limb.
- Hypogynous**, inserted below the ovary.

I

- Imbricate**, overlapping.
- Imparipinnate**, unequally pinnate; pinnate with a terminal leaflet or pinna.
- Impressed**, marked with small depressions, **nerves**, those slightly below the surface of the leaf.
- Incised**, cut sharply and irregularly.
- Included**, not protruding beyond the surrounding organs, usually said of stamens or styles that are not produced beyond the corolla.
- Incomplete**, said of a flower wanting calyx or corolla or both.
- Incumbent**, leaning upon.
- Indehiscent**, said of fruits the pericarp of which does not open to discharge the seeds.
- Indumentum**, a general term for any kind of hairy covering or coating.
- Induplicate**, with the margins folded inwards.
- Induplicate-valvate**, said of members of a whorl when they touch one another with margins of each folded inward.
- Indurated**, hardened.
- Inferior**, inserted below the ovary and free from it, if said of the

calyx; adnate to, or situated below the calyx, if said of the ovary; also anterior, when said of the relative position of the parts of a flower in an inflorescence.

Inflorescence, the mode in which flowers are arranged on the stem. Also used as a collective term for the whole flowering portion of the stem of a plant with its branches, bracts, bracteoles and flowers.

Infundibuliform, funnel-shaped.

Innate, said of an anther borne on the apex of the filament and with usually marginal dehiscence.

Innovation, a newly formed shoot.

Integuments, the coats of an ovule or seed.

Inter, (prefix) between.

Interpetiolar, said of stipules of opposite leaves when they are inserted between the petioles, *i.e.*, across the stem.

Intra, (prefix) within.

Intrapetiolar, is applied to stipules of single leaves when they are connate by their margins so as to form apparently one stipule.

Introrse, applied to anthers that dehisce or are turned towards the axis of the flower.

Intruded, projecting inward.

Involucre, a circle of bracts subtending a flower cluster.

Involute, rolled inward.

Irregular, wanting in symmetry of form, said of flowers with the petals or perianth segments unequal in size and shape.

Isomerous, having an equal number of members.

K

Keel, the central dorsal ridge, like the prow of a boat, formed by the two anterior and innermost petals of a Papilionaceous corolla.

Kernel, the contents of the putamen of a drupe.

L

Labiate, two-lipped.

Lacerate, irregularly cleft as if torn.

Laciniate, irregularly cut or fringed into narrow lobes or segments with narrow sinuses.

Lacunose, marked with minute pits or depressions.

Lamina, the blade of a leaf; the expanded portion of a clawed petal.

Lanate, woolly.

Lanceolate, shaped like a lance-head, *i.e.*, 2-4 times as long as broad, narrowed at both ends towards the apex, and broadest below the middle.

Latex, milky sap.

Lax, diffuse, said of an inflorescence when the flowers or fruits are not closely arranged on it.

Legume, a fruit of a single carpel usually opening by both sutures when ripe. See *Pod*.

- Lenticel**, a corky dot or protuberance on the bark. **Lenticellate**, having lenticels.
- Lenticular**, lentil shaped, *i.e.*, like a double convex lens.
- Lepidote**, scurfy with minute scales.
- Ligule**, anything shaped like a strap, such as the limb of the ray-corolla in some Compositæ; a thin and scarious projection from the summit of the sheath of the leaf of grasses; an outgrowth from the inner face of the base of some petals.
- Ligulate**, strap-shaped, usually applied to the ray-flowers of Compositæ.
- Limb**, the expanded part of a gamosepalous calyx or a gamopetalous corolla as distinguished from the tube; the blade of a clawed petal.
- Linear**, narrower than lanceolate, at least five times as long as broad.
- Lineolate**, marked with fine lines.
- Lip**, one of the two divisions of a bilabiate calyx or corolla.
- Littoral**, growing on or along the seashore.
- Lobulate**, divided into small lobes.
- Loculicidal**, applied to a kind of dehiscence of a capsular fruit in which splitting takes place through the cells.
- Loculus**, the cell of an ovary; the sac or cell of an anther.
- Lodicule**, one of the small scales which represent the perianth in the flower of a grass, occurring usually in pairs.
- Lomentum**, a form of legume which breaks up at maturity into one-seeded indehiscent segments.
- Lyrate**, pinnately lobed with a large terminal lobe and one or more pairs of small basal lobes, so as to resemble a lyre.

M

- Macro**, large or long (prefix).
- Mamillate**, having nipple-like prominences.
- Marcrescent**, withering without falling off like the petals of some flowers.
- Marginate**, having a border, with a distinctive texture.
- Median**, relating to the middle, in a plane radial to the axis of a plant.
- Medullary rays**, vtercular plates of cellular tissue which radiate from the centre of a dicotyledonous plant towards the cambium.
- Membranous**, thin, pliable like a membrane.
- Meristem**, tissue of cells capable of reproducing themselves by division.
- Mesocarp**, the middle layer of the pericarp.
- Micro**, small (prefix).
- Microphyle**, the minute orifice in the coats of a seed represented by a scar; the opening through the coats of an ovule at the apex of the nucellus.
- Mon**, **mono**, single, alone (prefix).

- Monadelphous**, said of stamens united by their filaments into one bundle forming a tube or column or sheath.
- Moniliform**, cylindrical and constricted at regular intervals so as to resemble a necklace of beads.
- Monœcious**, unisexual with the male and female flowers on the same plant.
- Monopodial**, pertaining to or of the nature of a monopodium, *i.e.*, a simple axis prolonged by means of a terminal bud.
- Mucro**, a short straight stiff and sharp point.
- Mucronate**, abruptly terminating in a mucro.
- Multi**, many (prefix).
- Multifarious**, in many vertical rows.
- Multifid**, cleft into many lobes or segments.
- Multiseriate**, in many series or rows.
- Muricate**, rough with sharp straight points.
- Muticous**, blunt.

N

- Needles**, the acicular leaves of conifers.
- Nerves**, the principal lateral ribs of a leaf. **Nervose**, with strongly developed nerves.
- Nodose**, with swollen joints; knotty, chiefly said of roots.
- Nucellus**, the central part of an ovule containing the embryo sac.
- Nucleus**, the solid portion of a winged seed or fruit; a clearly defined and comparatively dense portion of the cytoplasm which controls all activities of the cell.
- Nut**, a hard indehiscent 1-seeded fruit resulting from a syncarpous ovary.

O

- Ob**, reversed or inverted (prefix).
- Obconic**, inversely conical, *i.e.*, with the attachment at the pointed end.
- Obcordate**, inversely cordate, *i.e.*, broadly two-lobed with a notch at the apex.
- Obdiplostemonous**, having twice as many stamens as petals in two series, the outer being opposite the petals.
- Oblanceolate**, inversely lanceolate, *i.e.*, long, narrow and tapering at both ends, but broadest above the middle. **Oblanceoloid**, said of a solid having an oblanceolate outline.
- Oblique**, one-half larger than the other, unequal-sided—nerves, those making acute angles with the midrib.
- Oblong**, much longer than broad with the sides nearly parallel.
- Obovate**, inversely ovate, *i.e.*, egg-shaped in outline with the broad end towards the apex.
- Obovoid**, said of a solid which is inversely egg-shaped in outline.
- Obsolete**, rudimentary, imperfectly developed.
- Obtuse**, blunt or rounded at the apex.

- Ochrea, Ocrea**, a membranous tubular stipule or a pair of membranous stipules forming a sheath round the stem.
Oid, (suffix) resembling.
Operculum, a lid; a top which separates by a transverse line of separation.
Orbicular, orbiculate, flat with the outline circular or nearly so.
Order, a group of closely-related Families of plants.
Osseous, of bony texture.
Ovary, that portion of the pistil which includes one or more cavities or cells containing one or more ovules.
Ovate, egg-shaped in outline with the broad end towards the base.
Ovoid, said of a solid with an ovate or oval longitudinal section.
Ovule, the embryonic seed in the ovary.

P

- Palea, or pale**, a chaffy scale; the inner glume of the flower of a grass; the chaffy scales on the receptacles of many Compositae.
Paleaceous, chaff-like.
Palmate, with the midribs of the lobes or leaflets all radiating from the apex of the petiole, the segments like the spread fingers of the hand.
Palmatifid, palmate with the sinuses reaching half way down.
Palmatilobed, palmately lobed.
Palmatisect, deeply cut in a palmate manner.
Palmatipartite, with the segments palmately cut almost to the base.
Palminerved, with nerves radiating like the ribs of a palmate leaf.
Pandurate, Panduriform, fiddle-shaped.
Panicle, a compound inflorescence in which the main axis is racemose and the secondary and tertiary ramifications are racemose or not.
Papilionaceous, butterfly-like; applied to the kind of corolla characteristic of Papilionaceæ (the Pea Tribe) of Leguminosae. See *Keel, Wings & Standard*.
Papillose, bearing minute nipple-shaped projections.
Pappus, thistle-down, the hairy tufts on achenes and other fruits.
Paraboloidal, said of a solid having a parabolic, *i.e.*, ovate-oblong outline.
Parasite, a plant that grows on or in another plant, and draws nourishment from it.
Parietal, said of placentas attached to the wall of a more than 1-carpelled ovary.
Paripinnate, *Syn. abruptly pinnate*, evenly pinnate; pinnate without the terminal leaflet or pinna.
Patent, widely spreading.
Pedate, Palmately divided with the lateral segments 2-cleft.
Pedicel, the ultimate stock supporting a single flower in an inflorescence. **Pedicellate**, having a pedicel.

Peduncle, the stalk supporting a solitary flower or fruit or a cluster of flowers or fruits. **Pedunculate**, having a peduncle.

Pellucid, transparent or translucent.

Peltate, shield-shaped; said of a flat body (e.g., a leaf) attached to the stalk by the lower surface and not by the margin or base.

Penicillate, bordered or tipped with brush-like hairs.

Penninerved, pinnately nerved; with nerves spreading laterally from various points on the midrib.

Penta, five (prefix).

Pentadelphous, said of stamens arranged in 5 bundles.

Pentamerous, having the members in each whorl of the flower in fives.

Penultimate, next to the ultimate.

Perianth, a floral envelope; a term especially used when the calyx and corolla are similar in form and texture, or are represented by a single whorl.

Perfoliate, said of a sessile leaf the basal lobes of which pass round the stem and are connate on the other side of it.

Pericarp, the portion of the fruit formed of the ovary and whatever adheres to it, exclusive of, and outside, the seeds.

Perigynous, inserted around but away from the ovary; said of the sepals, petals and stamens of a flower when these are inserted on a tube formed by the torus (the calyx-tube) above the level of the base of the ovary.

Persistent, remaining attached; generally said of a calyx or a corolla which remains attached until the fruit is mature.

Perisperm, the outer endosperm of some seeds derived from the nucellus, e.g., Piperaceæ.

Perulate, wrapped in scales as many winter buds.

Petal, one of the divisions of the corolla.

Petiole, the stalk of a leaf. **Petiolate**, having a petiole. **Petiolule**, the stalk of a leaflet. **Petiolulate**, having a petiolule.

Phloem, the soft tissue of the inner bark.

Phylloclade, **Phyllocladium**, a modified branch that resembles a leaf in form and function C|p. **Cladote**.

Phyllodium, a petiole having the form and function of leaves.

Pilose, thinly sprinkled with long soft simple hairs.

Pinna, pl. **pinnæ**, the primary division of a bipinnate or tripinnate leaf. **Pinnule**, the secondary division of a tripinnate leaf.

Pinnate, a compound leaf is so called when the leaflets are arranged on either side of a common axis.

Pinnatifid, deeply pinnately lobed to about half way down.

Pinnatisect, pinnately cut nearly to the common axis.

Pisiform, pea-shaped.

Pistil, the female organ of a flower consisting normally of ovary style and stigma. **Pistillode**, a rudimentary or barren pistil.

Placenta, that portion of the interior of an ovary on which the ovules are borne. **Placentation**, position of the placenta.

Plumose, feathered; branches on either side like the plume or webs on the shaft of a feather.

Pod, the same as legume, but has a wider application, being used to denote any dry dehiscent many-seeded fruit, especially when it is much longer than broad.

Pollen, minute powder-like grains contained in the anther cells, the fertilizing agent of a plant.

Poly, many (prefix).

Polyadelphous, having the stamens united by the filaments into many sets or bundles.

Polygamous, with hermaphrodite and unisexual flowers on one or different plants.

Polyphyllous, said of a perianth having distinct leaves or segments.

Pome, a succulent fruit with seeds in many cartilaginous dry cells. *e.g.*, the apple and the pear.

Pore, a minute passage or orifice.

Posterior, said of that part of a flower which is nearest to the axis of inflorescence; superior.

Prickle, a sharply pointed stiff outgrowth of the epidermis.

Procumbent, } lying flat or close to the ground.

Prostrate,

Proximal, nearest the base or starting point.

Pruinose, covered with a whitish waxy bloom or powder.

Pseud, **Pseudo**, false (prefix).

Pseudocarp, a false fruit; one which has some portion other than the ovary so developed as to resemble a fruit.

Pubescent, covered with short soft straight simple hairs.

Puberulous, puberulent, minutely pubescent.

Pulvinate, cushion-shaped.

Pulvinus, the swollen base of petioles or petiolules.

Punctate, dotted with small punctures or glands. **Punctulate**, minutely punctate.

Pungent, terminating in or tapering gradually to, a hard sharp point.

Pustular, with small blister-like elevations.

Putamen, the shell of a nut; the hard endocarp of a drupe.

Pyrene, one of the small stones of a drupaceous fruit having more than one stone.

Pyriform, pear-shaped; obovoid with a tapering base.

Q

Quadrangular, four-cornered.

Quadrata, square.

Quinquefoliate, with five leaflets.

R

Raceme, an inflorescence of the indefinite kind in which the flowers are borne on pedicels of more or less the same length along a

- single undivided axis or rachis, the oldest flowers being lowermost.
- Rachis**, the principal axis of a pinnate leaf or of an inflorescence.
- Rachillum**, pl. **rachilla**, the secondary rachis of a compound spike; the rachis of a spikelet of grass.
- Radical**, relating to or springing from the root.
- Radicle**, the axis of an embryo below the cotyledons.
- Raphe**, the cord or ridge formed by the funicle along the side of some ovules.
- Raphides**, needle-shaped crystals found in the cells of some plants.
- Ray**, one of the radiating branches of an umbel. **Ray-florets**, the flowers borne on the rim or circumference of the heads in Compositæ usually differing in structure from those of the disk.
- Receptacle**, the torus of a flower; hence also what is commonly known as the fruit of figs.
- Reflexed**, bent abruptly backward or downward.
- Regular**, symmetrical, generally said of flowers with the petals or perianth-segments alike in size and shape.
- Reniform**, kidney-shaped; *i.e.*, broader than long, broadly cordate at the base, and with the auricles rounded.
- Repand**, having a wavy margin.
- Replum**, a septum joining the sutures of two carpels from which the carpels or valves finally separate, *e.g.*, Cruciferae.
- Resupinate**, turned or twisted so that parts are eventually turned to the opposite direction from their normal position, generally spoken of flowers.
- Reticulate**, having the veins connected together like the meshes of a net.
- Retinaculum**, a persistent hook-like, upcurved and subsequently hardened process from the placenta in most Acanthaceæ on which the ovules and seeds are borne.
- Retorse**, directed backwards or downwards.
- Retuse**, with a small shallow notch in a rounded or truncate apex.
- Revolute**, having the margins or apex rolled backward upon the under-surface.
- Rhizome**, an underground or prostrate stem of root-like appearance which sends off roots at the nodes and bears, like a true stem, buds, leaves or scales.
- Rhomboid**, **rhomboidal**, with four sides more or less equal, and the lateral angles obtuse.
- Rostrate**, beaked, narrowed into a slender tip or process.
- Rotate**, wheel-shaped; said of a regular gamo-petalous corolla with a short tube and a flat spreading limb.
- Rotundate**, circular or nearly so in outline.
- Rufous**, reddish brown.
- Rugose**, full of wrinkles. **Rugulose**, minutely wrinkled.
- Ruminate**, marked by transverse lines of divisions, said of albumen of some seeds, *e.g.*, Anonaceæ.

Runcinate, toothed or incised with the teeth or segments pointed backwards.

Runner, a very slender prostrate branch arising from the base of a stem, rooting at the nodes or tip and sending up shoots which form new plants.

S

Saccate, bulged into a small bag or cavity.

Sacciform, in the form of a bag.

Sagittate, shaped like an arrow-head; tapering towards the apex, two lobed at the base with the lobes pointed and directed downwards.

Salver-shaped, with a long tube and horizontally spreading limb, C[p. **hypocrateriform**.

Samara, an indehiscent dry fruit with a wing developed from the pericarp.

Saprophyte, a plant that is nourished by dead organic matter.

Sarmentose, producing long straggling woody branches.

Scabrous, very rough to the touch owing to short stiff hairs. **Scabrid**, **Scaberulous**, somewhat scabrous.

Scalariform, joined by transverse bars or with transverse markings like the rungs of a ladder.

Scandent, climbing.

Scapae, a leafless and generally unbranched flower-stem arising from the ground.

Scarious, **scariose**, thin, dry, membranous, somewhat stiff and not green.

Schizocarp, a general name for a dry fruit which on maturity splits into one-seeded portions.

Sclerotic, hardened or stony in texture.

Scorpioid, said of a form of unilateral inflorescence which is coiled inward from the apex to the base in the bud like the tail of a scorpion.

Scurf, loosely adherent epidermal scales.

Second, said of parts of organs all of which are turned in the same direction.

Sect, (suffix) deeply cut nearly to the axis.

Sepal, one of the parts of leaves of the calyx, especially when not combined; **Sepaloid**, green and resembling a sepal in structure.

Septicidal, a form of dehiscence of a ripe carpel when it opens through the dissepiments or lines of junction of the carpels.

Septifragal, a form of dehiscence of a ripe carpel when the valves break away from the dissepiments and leave the latter attached to the axis.

Spetum, pl. **septa**, see Dissepiment. **Septate**, divided by one or more partitions.

Seriate, in rows transverse or lengthwise.

Sericous, covered with silky straight hairs.

Serrate, toothed like a saw with the teeth directed forward.

Serrulate, minutely serrate.

Sessile, without a stalk.

Seta, a bristle. **Setaceous**, bristle-like. **Setose**, bristly. **Setulose**, bearing minute bristles.

Sheath, a close fitting tubular or enrolled case, *e.g.*, the lower portion of the leaf of grasses.

Simple, undivided; consisting of one blade when said of a leaf; resulting from a single pistil when said of a fruit; unbranched when said of a stem, tendril, or style.

Sinistrorse, turning or twining from right to left *i.e.*, clock-wise.

Sinus, the space between the divisions or lobes of a leaf. **Sinuate**, with an irregular deeply wavy margin.

Spadix, a spike with a thickened or fleshy axis bearing l-sexual flowers generally sheathed in a spathe.

Sparse, arranged at some distance from each other.

Spathe, a large sheath-like bract enclosing an inflorescence or part of it. **Spathaceous**, spathe-like.

Spatulate, **Spathulate**, shaped like a spatula, *i.e.*, oblong with a broad and rounded apex and gradually narrowed base.

Species, a group of individuals alike in all essential particulars; the subdivisions of a genus.

Spike, a racemose inflorescence bearing sessile flowers, on an undivided axis. **Spicate**, in the form of or resembling a spike, or disposed in spikes. **Spikelet**, a secondary spike; an ultimate branchlet of the inflorescence of grasses and **Cyperaceæ** generally consisting of one or more flowers subtended by glumes.

Spine, a strongly pointed woody process consisting of a modified branch but sometimes of a modified leaf. **Spinescent**, terminating in or resembling a spine-like sharp point; also becoming spinous. **Spinose**, **spinous**, furnished with or of the nature of spines.

Sporadic, occurring scattered here and there.

Spore, a minute unicellular body which detaches itself at maturity and is instrumental in the process of sexual reproduction in Cryptogams.

Squamose, beset with scales.

Stamen, the male organ of a flower, consisting of a filament and an anther. **Staminode**, an abortive or antherless stamen.

Standard, the posterior or odd petal of Papilionaceous corolla.

Stellate, star-shaped; with radiating rays like points of a star.

Stigma, that part of the pistil which is specially adapted for the reception of the pollen for the fertilization of the ovules.

Stigmatic, relating to the stigma. **Stigmatose**, resembling or of the nature of the stigma.

Stipe, any stalk-like support; the stalk of an ovary above the floral whorls. Syn. gynophore. **Stipitate**, having a stipe.

Stipule, an appendage of a leaf, usually one on either side of the

- petiole. **Stipulate**, having stipules. **Stipel**, a secondary stipule, the appendage of a leaflet. **Stipellate**, having stipels.
- Stolon**, a prostrate or reclined branch rooting at intervals or only at the tip and giving off shoots which become independent plants.
- Stone**, the hard endocarp of a drupe. Syn. Putamen.
- Striate**, marked with thin longitudinal lines or minute furrows.
- Strigose**, covered with sharp pointed straight stiff hairs of unequal length lying close along the surface and all in the same direction.
- Strophiole**, a crest-like appendage about the hilum or the base of a seed. C/p Caruncle.
- Style**, a stalk-like outgrowth from the summit of the ovary supporting the stigma.
- Stylopodium**, a fleshy disk at the base of some styles as in many Dipterocarpaceæ.
- Subulate**, shaped like a cobbler's awl; narrow, tapering and somewhat stiff.
- Succulent**, with abundant cellular tissue full of juice.
- Suffrutescent**, said of plants when low woody and branching from near the base.
- Sulcate**, grooved or furrowed with the depressions more or less parallel.
- Superior**, inserted on the ovary or adnate to it, if said of the calyx; above the calyx and free from it, if said of the ovary; also posterior in position.
- Superposed**, placed one above the other.
- Suture**, a seam indicating the line of union of two parts; a line of opening.
- Symmetrical**, said of a flower having the same number of members in each whorl.
- Syncarpous**, composed of two or more combined carpels.
- Syncarpium**, a fruit formed by the union of several carpels which have become compacted and fleshy.
- Syngenesious**, said of stamens united by their anthers, as in Compositæ.

T

- Tap-root**, primary root resulting from the direct prolongation of the radicle.
- Tendril**, a slender process usually belonging to the axis and serving as a support in climbing.
- Tepal**, a division of a perianth; a word applicable to either a sepal or a petal. "An anagram of petal," Jackson.
- Terete**, cylindrical, rounded in cross section.
- Ternate**, arranged in threes in a cluster of whorl.
- Tesselated**, divided up into small squares.
- Testa**, the outermost coat of a seed.
- Tetra**, (prefix) four.
- Tetradynamous**, with four long and two short stamens.

- Tetramerous**, said of a flower having the parts or members in each whorl in fours.
- Tetrandrous**, with four stamens.
- Thalamus**, that part of the axis of a flower which supports the floral whorls and the pistil. Syn. Torus.
- Thyrus**, a contracted panicle, ovate or lanceolate in outline, usually with cymose branches. **Thyriform**, of the shape of a thyrus.
- Thyrroid**, somewhat like a thyrus.
- Tigellum, Tigellus (plu.)**, the central embryonic axis consisting of radicle and plumule.
- Tiller**, a sucker from the base of a stem.
- Tissue**, an aggregation of cells differentiated from surrounding aggregations.
- Tomentose**, covered with short, soft, rather dense and more or less tangled hairs.
- Tortuous**, bent irregularly in different directions.
- Torulose**, cylindrical with contractions at regular intervals.
- Torus**, same as thalamus.
- Tri**, (prefix) three.
- Tribe**, a division of a family, comprising a number of closely-related genera.
- Trichotomous**, with the divisions always in threes and of more or less the same length.
- Tricuspidate**, with three cusps or sharp points.
- Trimerous**, said of a flower having the parts or members in each whorl in threes.
- Triplinerved**, with a strong secondary nerve on either side of the midrib proceeding from near the base.
- Triquetrous**, sharply 3-cornered.
- Tristichous**, in three vertical rows.
- Truncate**, ending abruptly, as if with the end cut off.
- Tuber**, a thickened underground stem bearing buds or 'eyes.'
- Tuberous**, swollen like a tuber.
- Tumid**, swollen.
- Turbinate**, top-shaped; like an inverted cone.
- Turgid**, swollen and more or less firm.

U

- Umbel**, a form of racemose inflorescence in which several branches or pedicels radiate from the top of a common peduncle and are of nearly the same length.
- Umbonate**, bearing a boss, or conical or rounded protuberance.
- Undulate**, with a wavy margin.
- Uni**, (prefix) one.
- Unicellular**, formed of, or consisting of, only one cell.
- Unilateral**, arranged on one side of the axis.
- Unisexual**, of one sex; having the stamens and the pistil in separate flowers.
- Urceolate**, urn-shaped.

Urticle, a 1-celled 1-seeded fruit with a thin and more or less loose pericarp.

V

Valvate, with the margins of the members of a whorl only meeting without overlapping. Also dehiscing by valves.

Varicose, irregularly swollen at intervals.

Variety, a group of individuals differing from others of the same species in certain striking particulars which, however, are not of a nature to justify specific rank; sub-divisions of a species.

Venation, the mode in which the veins are disposed in a leaf.

Ventral, relating to, attached to the, or opening by the inner angle, or anterior face of a carpel.

Venulose, closely and finely veined.

Ventricle, a lateral swelling or bulging out. **Ventricose**, having a ventricle; unequal swollen.

Verrucose, covered with wart-like excrescences.

Versatile, swinging to and fro; said of an anther attached by the back to the attenuated top of the filament on which it swings.

Verticillate, arranged in whorls.

Villous, **Villose**, more or less thickly covered with long soft simple hairs.

Virgate, with slender erect rod-like stems or branches.

Vitta, pl. **Vittæ**, one of the oil receptacles in an umbellifer fruit.

Viviparous, said of plants, the seeds of which germinate before falling; also sometimes of such seeds.

W

Whorl, a collective name for all similar members that are arranged in a circle, round an axis.

Wing, any thin membranous appendage. **Wings**, the side petals of a papilionaceous corolla.

X

Xerophyte, said of plants that grow naturally in dry hot places.

Xylem, woody tissue.

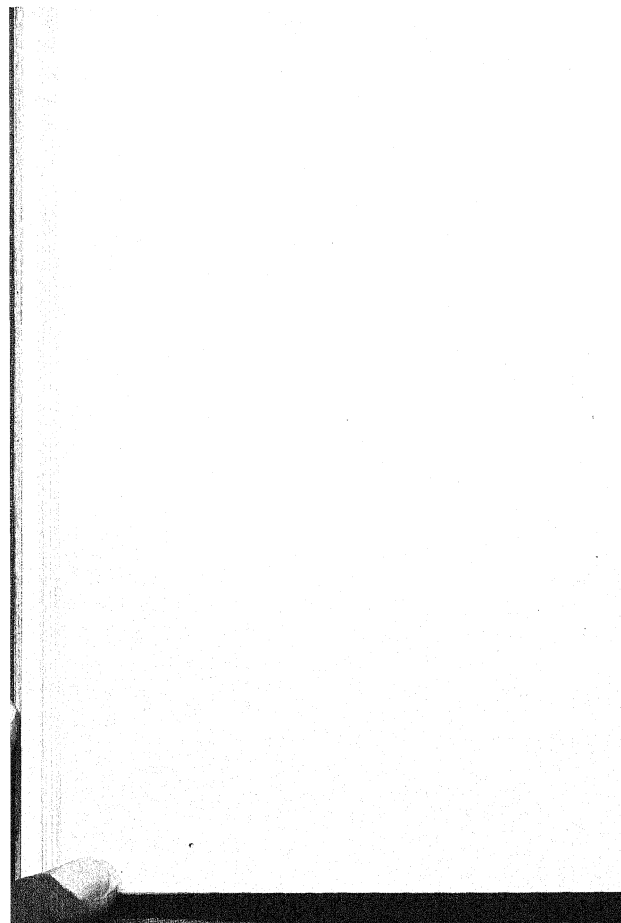
Z

Zygomorphic, capable of being bisected into similar halves by the median plane only; said usually of irregular flowers.

LIST OF ABBREVIATIONS AND SIGNS USED IN THE FLORA.

Ass.	..	..	..	Assamese.
Beng.	..	..	..	Bengali.
Cach.	..	..	..	Cachari.
Darr.	..	..	..	Darrang.
Duff.	..	..	..	Duffla.
fem.	..	..	..	female.
fld.	..	..	..	flowered.
fls. or flrs.	..	..	..	flowers.
1-2, 6-8	..	..	..	January to February. June to August.
fr.	..	..	..	fruit.
ft.	..	..	..	foot or feet.
herm.	..	..	..	hermaphrodite.
Hind.	..	..	..	Hindi.
in.	..	..	..	inch or inches.
Kach.	..	..	..	Kachari.
Kam.	..	..	..	Kamrup.
Kh.	..	..	..	Khasi.
loc.	..	..	..	locular.
Lush.	..	..	..	Lushai.
Manip.	..	..	..	Manipur.
Mik.	..	..	..	Mikir.
m. s.	..	..	..	moderate or middle-sized.
Nep.	..	..	..	Nepali.
Sans.	..	..	..	Sanskrit.
Sibs.	..	..	..	Sibsagar.
sp.	..	..	..	species.
stip.	..	..	..	stipule.
Sylh.	..	..	..	Sylhet.
syn.	..	..	..	synonym.
Synt.	..	..	..	Synteng.
Tipp.	..	..	..	Tippera.
var.	..	..	..	variety.
♂	..	..	..	male.
♀	..	..	..	female.
∞	..	..	..	indefinite, numerous.

- ! Added after a locality, but without the name of collector or herbarium signifies that the author has himself seen the plant in the locality named.
- ! The same sign following the name of a person in italics signifies that the author has either not seen it or is uncertain of the identification.
- = Equal to or Synonym.
- ?, (?) Doubtful.
- + The plus sign when used for parts of a flower, *e.g.*, petals 3+3, indicates separate whorls. In the example two whorls of 3 petals in each whorl.



FLORA OF ASSAM

THALAMIFLORÆ.

FAM. 1. RANUNCULACEÆ.

Herbs or climbing shrubs. *Leaves* alternate, rarely opposite, usually ex-stipulate, simple or compound; petiole sheathing. *Flowers* usually regular, generally ebracteate. *Sepals* 4-5 or more, usually caducous, often coloured. *Petals* hypogynous, generally imbricate, 3-5 or more, often reduced or deformed, sometimes absent. *Stamens* hypogynous, usually numerous, often in many rows; anthers adnate and usually dehiscent laterally. *Ovary* apocarpous, rarely syncarpous; carpels many or few, free, 1-celled with one or more anatropous, erect or pendulous ovules. *Fruit* either of many achenes or of follicles, rarely a berry; seeds small with copious albumen and minute embryo.

- I. Flowers regular. Carpels 1-ovuled :—
 - Erect or climbing shrubs :—
 - Leaves opposite, Sepals petaloid, valvate.
 - Ovules pendulous :
 - Leaves various, not terminating in a tendril. Petals 0. 1. **Clematis.**
 - Leaves consisting of two opposite leaflets and a terminal tendril. Petals many, linear. ... 2. **Naravelia.**
 - Herbs :—
 - Petals 0. Sepals 4-5, petaloid. Ovule pendulous :—
 - Flowers in umbelliform cymes, involucrate. ... 3. **Anemone.**
 - Flowers panicled, not involucrate. ... 4. **Thalictrum.**
 - Petals and sepals both present. Flowers panicled.
 - Ovule erect. ... 5. **Ranunculus.**
- II. Flowers irregular, racemed. Carpels many-ovuled. ... 6. **Delphinium.**

1. CLEMATIS, Linn.

Shrubs, mostly woody, climbing by means of their petioles. *Leaves* opposite, exstipulate, usually compound; leaflets often lobed and irregularly toothed. *Flowers* in axillary fascicles or panicles, rarely solitary or terminal. *Sepals* usually 4, valvate, petaloid. *Petals* 0. *Stamens* and *carpels* indefinite. *Fruit* a head of achenes usually with elongated feathery styles.

1. Flowers not panicled :—
 - Flowers axillary, solitary, bluish; pedicels long bracteate. Achenes without feathery tails. Leaves ternately compound. ... 1. **C. Cadmia.**
 - Flowers axillary, 1-3 in each axil, brownish; pedicels short, ebracteate. Achenes with feathery tails. Leaves 2-pinnate. ... 2. **C. acutangula.**
 - Flowers axillary fascicled white; pedicels long, ebracteate. Achenes with feathery tails. Leaves 3-foliolate. ... 3. **C. montana.**

II. Flowers in axillary panicles. Achenes with feathery tails :—

- A. Sepals spreading from the base :—
 Leaves usually simple. Flowers large ; sepals brown outside, purple or white inside. ... 4. *C. smilacifolia*.
 Leaves 3-foliate, long petioled. Flowers very small. ... 5. *C. apiculata*.
 Leaves once pinnate. Flowers small ; sepals 3-nerved. ... 6. *C. puberula*.
 Leaves 2-pinnate or 2-ternate. Flowers small ; sepals greenish-white. ... 7. *C. goutiana*.
 B. Sepals erect with recurved tips :—
 Leaves 3-foliate, rarely simple, shining. ... 8. *C. acuminata*.
 Flowers fairly large.
 Leaves pinnately 3-5-foliate. Flowers large ; sepals brown-tomentose outside, pubescent inside ; not ribbed ; anthers very long, twisted after flowering. ... 9. *C. grewiaefolia*.
 Leaves pinnately 5-7-foliate. Flowers large, brownish ; sepals linear-oblong, ribbed, tomentose throughout ; anthers not twisted after flowering. ... 10. *C. Buchananiana*.
 Leaves decompositely pinnate. Flowers large, pale yellow ; sepals many nerved. ... 11. *C. nutans*.

1. *Clematis Cadmia*, Ham. Vern. *Bon-jalukia*, Ass. (Lakh.)
Bon-marich, Ass. (Goal).

A slender sub-herbaceous climber. *Leaves* 3-9 in. long, ternately decompositely ; ultimate leaflets, 7-2 by .25-1 in. narrow-lanceolate to ovate or rhomboid, entire or minutely crenulate acuminate, more or less ciliate along the margins otherwise glabrous, 3-5-nerved from the acute, cuneate or rounded, rarely sub-cordate base ; other nerves 1-3 on either half, much arched, anastomosing, very indistinct. *Flowers* axillary, solitary ; peduncles 3-4 in. long, with a pair of opposite, leaflike, sessile or short-petioled bracts about the middle. *Sepals* 5-6, bluish-white, .8-1 by .2-5 in. longitudinally veined, softly tomentose behind. *Filaments* numerous, short flat, glabrous ; anthers .1-15 in. long, dehiscing laterally. *Achenes* many, ovate, with a long straight beak and no feathery tail.

BRAHMAPUTRA VALLEY generally with reeds along edges of open swamps, also in SYLHET. G. Mann !
 Figs. 1-4. Fr. 2-6.

2. *Clematis acutangula*, Hk. f. & Th.

A slender woody climber ; stem deeply furrowed, sparingly puberulous, shining. *Leaves* 2-pinnate .5-9 in. long ; common petiole 2-5 in. long ; pinnæ generally 3-foliate ; petiolules of pinnæ 1.5-3 in. long. *Leaflets* .5-2 by .15-.8 in. ; ovate or ovate-lanceolate, acute, or acuminate, deeply serrate or lobed, coarsely hairy on both surfaces. *Flowers* brownish-yellow, about .7 in. diam. ; pedicels 1-3 from each axil, 1-1.5 in. long, not bracteate. *Sepals* 4 or 5, about .4 in. long, oblong, acute, puberulous outside. *Filaments* pilose ; anthers introrse. *Achenes* ovate, strongly margined, pubescent ; feathery style about 1 in. long, brownish.

KHASI HILLS, 4-5,000 ft., not very common.
 Figs. 9-10. Fr. 10-11

3. *Clematis montana*, Ham. Vern. *Jarmai-thobawa*, Synt. A large, but not very heavy, woody climber; young parts pubescent. *Leaves* 3-foliolate, fasciated at the nodes; common petiole 1.5-2.5 in. long. *Leaflets* 1-4 by .5 to 2 in., ovate, distantly cuspidate-serrate, acute, membranous, scattered hairy or glabrescent, 3-5-nerved from the base; tertiary nerves few, distant, indistinct; lateral petiolules 1-3 in. long. *Flowers* white, axillary, solitary, 2-3 in. diam., faintly scented; peduncles 2.5-4 in. long, terete, pubescent. *Sepals* 4, 1-1.5 by .5-1 in., acute or acuminate, longitudinally veined, softly tomentose along the margins. *Filaments* short; anthers shorter than the filaments, introrse. *Achenes* glabrous or hairy; style .6-1.2 in. long, rather stout; densely hairy.

KHASI HILLS. 4-5,000 ft., e. g., Shillong, Nong-kasem, Sutynga, etc. NAGA HILLS. C. B. Clarke!

Fls. 4-5. Fr. 5-6.

4. *Clematis smilacifolia*, Wall. Vern. *Mei-long-kydup*, Khasi.

A large woody climber; branches sulcate glabrous, green or purplish. *Leaves* usually simple; blade 3-9 by 1-6 in. ovate-cordate, acuminate, gradually smaller and narrower and with a cuneate base towards the ends of the branches, entire or distantly serrate, coriaceous, glabrous, 5-9-nerved from the base, tertiary nerves faint, more or less transverse; petioles 3-6 in. long, terete, often much coiled and functioning as tendrils. *Panicles* axillary, 6-12 in. long; pedicels 1.5-2 in. long, with linear bracteoles at the base. *Flowers* 1-1.5 in. across, sweet-scented. *Sepals* 4-5, .7-1 in. long, oblong, greenish-brown tomentose outside, glabrous and purplish or whitish inside. *Filaments* linear, membranous; glabrous, gradually shorter towards the centre of the flower; connectives produced. *Achenes* .3-4 by .1 in., flat, acute at both ends, with thickened margins which coalesce and prolong to form a slender feathery tail 1.5-2.5 in. long and of a cream colour.

LOWER ASSAM, e.g., Bijni Reserve, GOALPARA, also KHASI HILLS up to 4,000 ft., e.g., Nonghulen.

FIS. 9-10. Fr. 11-1.

5. *Clematis apiculata*, Hk. f. & Th.

A slender woody climber; branches, sulcate, patently grey, hairy. *Leaves* 3-foliolate, sometimes simple and 3-lobed; common petiole 2-3 in. long, slender, patently hairy. *Leaflets* .8-3 by .6-2 in., ovate-cordate, acuminate, crenate-serrate, membranous, sparsely pubescent on both surfaces, ciliate; lateral petiolules .2-7 in. long. *Flowers* small in many-flowered axillary panicles. *Sepals* 1.5-2.5 in. long, oblong, tomentose outside. *Filaments* short, linear. *Achenes* oval, hairy.

KHASI HILLS near Beadon Falls! also Nongkhlaw. Griffiths! and Cherra, Hk. f. & Th. Apparently not very common.

Fig. & Frg. time not known.

6. *Clematis puberula*, Hk. f. & Th.

A slender climber; stem deeply grooved, downy. *Leaves* pinnate. *Leaflets* 1-1.5 in. long, ovate-lanceolate, remotely toothed

sparsely hairy. *Flowers* rather small in few-flowered axillary panicles; pedicels slender. *Sepals* about .5 in. long, linear-oblong, 3-nerved, silky outside. *Filaments* narrow; anthers short. *Achenes* silky.

KHASI HILLS. 2,-4,000 ft. Rather rare.

Flg. & Frg. time not known.

7. *Clematis gouriana*, Roxb. Vern. *Jyrm-bytengdoh*, Khasi.

A large spreading climber; branches purple, sulcate, pubescent when young. *Leaves* 2-pinnate or 2-ternate. *Leaflets* 1-3.5 by 3-1.3 in., ovate, oblong or lanceolate, acuminate, entire or distantly toothed, rounded or cordate at the base, chartaceous or membranous, wholly glabrous or sometimes pubescent beneath. *Flowers* greenish-white, small, in dense axillary panicles; ramifications of panicle bracteate at the base. *Sepals* .2-3 in. long, oblong, revolute; margins tomentose; *filaments* narrow. *Achenes* about .05 in. long, narrow-oblong or lanceolate, densely grey-hairy; feathery tails 1.5-2 in. long, very slender.

Common in LOWER ASSAM, especially GOALPARA, also up to 4,000 ft. in the KHASI HILLS.

Fls. 10-11. Fr. 11-1.

8. *Clematis acuminata*, DC. Vern. *Tilli-tymen-khla* Synt.

A large woody climber; branches slender, terete, smooth, glabrous. *Leaves* 3-foliate, very rarely simple; common petiole 1-1.5 in. long, slender, terete. *Leaflets* 1.5-3.5 by .5-1.3 in. ovate, or oblong-lanceolate, caudate-acuminate, usually quite entire, membranous or subcoriaceous, glabrous; lateral nerves slender, irregular, very indistinct. *Flowers* 1-1.5 in. across, in decomposed axillary panicles. *Sepals* oblong-lanceolate, more or less pubescent outside, suberect. *Filaments* clothed with long spreading hairs. *Achenes* silky.

Evergreen forests in UPPER ASSAM, e.g., near Tippam in LAKHIMPUR and possibly in many other similar localities.

Flg. and Frg. time not known.

Var. sikkimensis, distinguished by larger leaflets and more numerous flowers, occurs at Nongpoh in the KHASI HILLS, also in the MISHMI HILLS.

9. *Clematis grewiaefolia*, DC. Vern. *Mei-iong* (black climber), *Mei-si-ing*, Khasi.

A large woody climber; branches closely sulcate and more or less densely dun-pubescent. *Leaves* 3-5 foliolate; common petiole 3-4 in. long, stout, often curled, as well as the rest of the rachis, densely brown-tomentose. *Leaflets* 2-3.5 by 1-5-2.5 in. broadly ovate-cordate, dentate, serrate, often lobed, membranous or softly subcoriaceous, coarsely scattered-hairy or sub-glabrous above, more densely hairy especially along the nerves beneath, 5-nerved from the base; lateral petiolules .5-1 in. long, with a tendency to curl. *Panicles* 4-8 in. long, on peduncles 1.5-4 in. long; buds globose or ovoid; pedicels 1-2 in. long, often twisting, supported by bracts resembling variously lobed miniature leaflets. *Sepals* .8-1.2

in., ovate or oblong, greenish-brown and densely tomentose outside, pubescent or puberulous inside. *Filaments* .7-1 in. long, tapering from a narrow linear base, densely covered with ascending hairs; anthers .25-.3 in. long, very narrow, twisted after flowering. *Achenes* scarcely .1 in. long, flat, ovate, velvety; feathery tail about 1 in. long, densely white-silky.

North Cachar and Khasi Hills, -3,-5,500 ft. e. g., Maibong, Kynshi, Mairong, Mawsynrang, etc.

Fls. 11-12. Fr. 12-1.

10. *Clematis Buchananiana*, DC. Vern. *Mei-byteng-doh*, *Mei-tih* (white climber), Khasi; *Jermai-sniuh*, *Tilli-kynsaw-blai*, Synt.

A woody climber; branches sulcate, pubescent while young. *Leaves* pinnately 5-7-foliolate; common petiole 2-3.5 in. long, often twisted. *Leaflets* 2-4 by 1.5-2.7 in. broadly ovate or suborbicular, generally cordate, coarsely dentate-serrate, often irregularly lobed, subcoriaceous or membranous, glabrescent above, pubescent beneath chiefly along the nerves, 3-5-nerved from the base; lateral petiolules .6-1.2 in. long, often curled. *Flowers* about 2 in. across, usually sweet-scented, in large axillary panicles. *Sepals* linear-oblong fleshy, longitudinally many-ribbed, softly silky-tomentose. *Filaments* hairy. *Achenes* ovate-lanceolate, densely hairy; hairy tail elongating in fruit to about 2 in.

North Cachar Hills at about 4,000 ft. Khasi and Jaintia Hills, 4,000-5,500 ft. Very common in the Mantedu valley in the Jawai Sub-Division.

Var. *vittifolia* distinguished by pubescent stems and membranous pubescent leaves, is fairly common in the above tracts.

Fls. & Fr. 12-1.

11. *Clematis nutans*, Royle.

Stem slender, woody, angled, sulcate, with leaves very pungent to the taste. *Leaves* twice or thrice, pinnate. *Leaflets* 1-3 in. long, ovate or lanceolate, usually deeply 3-5-lobed, rarely entire, silky-pubescent; veins slender. *Flowers* 1-2 in. across, cream-coloured in much-branched panicles. *Sepals* .5-.7 in. long, oblong, closely nerved, silky outside, erect at the base, recurved at the tip. *Filaments* tapering, silky along the lower half; anthers short, *Achenes* large, ovate, covered with silky hairs; hairy tail 1-1.5 in. long in fruit, very slender.

Occurs chiefly in the Jawai Sub-Division, Khasi and Jaintia Hills, in the neighbourhood of Nartiang.

The leaves when smelt after bruising produce violent sneezing.

Fls. 11-12.

Clematis tortuosa, Wall. Cat. 4675, ex. C. E. C. Fischer, Kew Bulletin 1929 p. 4. Incl. *C. Buchananiana*. DC. var. *tortuosa*, Wall. Cat. 4675 and var. *vittifolia*, Wall. Cat. 4676.

Branches pilose with long spreading fulvous hairs. *Leaf* rachis and petiole, pilose or pubescent with brown hairs. *Leaflets* 2-5 by .7-4.5 in. ovate-lanceolate to suborbicular, acuminate base 5-7-nerved, margins irregularly coarse dentate, or crenate-dentate, teeth apiculate, membranous or subcoriaceous, thinly pilose on both surfaces or only on the nerves; petiolules .5-4 in. long, often twining. *Panicles* axillary, densely to thinly fulvous pilose; pedicels .7-1.5 in. long. *Sepals* 4, erect, oblong, apex recurved, .5-.8 in. long, densely clothed with light brown hairs outside. *Carpels* pilose, styles long, slender densely silky.

Very closely allied to *C. Buchananiana* of which it has been regarded as a variety in F. B. I.

SYLHET Wall. Cat. 4675 ! KHASI HILLS Wall. Cat. 4676 ! Hooker and Thomson, NAGA HILLS—Kingdon Ward, LUSHAI HILLS Mrs. Parry.

2. NARAVELIA, DC.

Naravelia zeylanica, DC. Vern. *Gorap-choi*, Ass. ; *Chhagal-lati*, Beng. ; *Rammam-riube*, Miri ; *Khoro-soi-rikang*, Nongnongbiki-ringkang, Mik. ; *Jyrmal-lasam*, Khasi ; *Sangongri*, Shamgangri, Behalisham, Garo.

A woody climber generally spreading on bushes in scrub jungles ; branches sulcate, adpressed pubescent. *Leaves* pinnately 5-foliolate on seedlings, but on mature plants the upper three leaflets become reduced to tendrils ; common petiole 1.5-3 in. long. *Leaflets* usually only two, often in unequal pairs, 2-6 by 1.7-4.5 in., ovate-rotundate, acuminate, rounded or cordate and often abruptly cuneate at the base, entire or distantly toothed soubeoriceous, glabrous and somewhat shining above, more or less pubescent along the nerves and nervules beneath, 5-7 nerved from the base, nervules reticulate, very close ; petiolules 3-1.5 in. long, usually more or less twisted, densely pubescent. *Panicles* terminal and axillary, 4-18 in. long. *Flowers* greenish, 5-7 in. across ; pedicels 5-8 in. long, slender, pubescent. *Sepals* 4-5, 2-3.5 in. long, densely buff-tomentose outside, caducous. *Petals* usually 12, about 5 in. long, greenish, club-shaped. *Stamens* numerous. *Fruit* a head of tailed achenes. *Achenes* 2-2.5 in. long, pointed at both ends, shortly stipitate, more or less twisted, brown when mature ; tail 2-3 in. long, very slender, finely hairy.

Throughout the BRAHMAPUTRA VALLEY and both slopes of the GARO and KHASI HILLS up to 2,500 ft.

The stems are used as tooth-sticks to cure toothaches and can be twisted into rough but strong ropes.

Fls. 10-11. Fr. 12-3.

3. ANEMONE, Linn.

Perennial herbs. *Leaves* radical, more or less lobed or divided. *Flowers* single or several together on simple or branched scapes, supported by a 3-partite involucre ; bracts free or connate. *Sepals* 4-20, petaloid, white or bluish, imbricate. *Petals* 0. *Stamens* numerous, outer sometimes petaloid. *Carpels* many, 1-ovuled ; ovules pendulous. *Fruit* a head of sessile achenes, beaked with short or long, hooked or straight, naked or bearded, persistent styles.

Stems branched. Ultimate segments of involucre linear-oblong. Achenes large, oblong. Beak hooked, naked.

1. *A. rivularis*.

Stems elongate usually not branched. Ultimate segments of involucre oblong, or cuneate. Achenes compressed, broadly oval. Beak straight, naked.

2. *A. elongata*.

1. *Anemone rivularis*, Ham. Vern. *Bat-soh-plia*, Khasi.

Stem branched, 1-3 ft. high; rootstock woody, sheathed in fibres. *Leaves* radical, 2-6 in. diam., silky pubescent beneath, palmately 3-partite, inducing sneezing if smelt after bruising; segments primarily 2-or 3-lobed and serrate; nerves straight, prominent beneath sparingly anastomosing; petiole 4-6 in. long.

Flowers about 1 in. across in compound cymes, 2-bracteolate; sepals white within, generally bluish and silky outside. *Involucre leaves* large, 3-partite; ultimate segments linear or linear oblong, inciso-serrate. *Achenes* oblong glabrous; style hooked.

Common in shady or dampish place in the KHASI HILLS between 4,000 and 4,500 ft.

Fls. 4-7.

2. *Anemone elongata*, Don.

Stem slender, unbranched or sparingly branched 2-3 ft. high, pubescent. *Radical Leaves* 2-4 in. diam., orbicular in outline, cordate, 3-partite, sparingly hairy; segments 2-3-lobed; lobes dentate. *Flowers* white, smaller than of the above, in fascicles of 2-3 in few-flowered elongate compound cymes. *Involucre leaves* oblong or cuneate, irregularly toothed.

Fairly common in the KHASI HILLS. 5,000 ft.

4. THALICTRUM, Linn.

Erect perennial herbs; stem hollow. *Leaves* ternately or pinnately once to thrice or more times compound, rarely simple; petioles sheathing, often auricled or stipuled. *Flowers* generally paniced, rarely racemed, never involucre, often polygamous. *Sepals* 4-5, petaloid, imbricate in bud. *Petals* 0. *Stamens* numerous. *Carpels* few or many; ovule 1, pendulous. *Fruit* a head of small achenes; style persistent or deciduous.

Filaments filiform. Achenes small:—

Leaves 1-2-ternate: leaflets 5-8 in. diam.

... 1. *T. punduanum*.

Leaves pinnately decompound: leaflets

usually not exceeding 5 in. in diam.

... 2. *T. foliolosum*.

Filaments club shaped. Achenes large:—

Leaves ternately decompound: leaflets not exceeding 5 in. in diam.

... 3. *T. javanicum*.

1. *Thalictrum punduanum*, Wall.

Stem erect about 2ft. high. *Leaves* ternate or 2-ternate; leaflets 1-2 in. in diam., more or less orbicular, cordate or truncate at the base, 5-lobed, crenate, glaucous, or tomentose beneath; sheath auricled. *Panicle* much branched. *Flowers* white; filaments filiform. *Achenes* numerous, small, ribbed, sessile or stalked.

Two varieties occur almost side by side, in the KHASI HILLS.

Var. 1. *glaucum*. Leaflets membranous, glabrous, glaucous beneath. Achenes sessile, glabrous.

Var. 2. *glandulosum*. Leaflets coriaceous, viscid-pubescent beneath. Achenes stalked or subsessile, glandular hairy.

2. *Thalictrum foliolosum*, Bl. Vern. *Popum*, Khasi.

By far the tallest plant in the genus reaching up to 8 ft. in height; stem glabrous. *Leaves* pinnately decompound up to the

fourth degree; leaflets '15-25 in., but sometimes up to '8 in. in diam., sub-orbicular, membranous, glabrous, glaucous beneath; sheath auricled. *Panicle* axillary and terminal, profusely divided bracts and bracteoles minute. *Flowers* '1-15 in. long, polygamous, on filiform pedicels, dull bluish or greenish-white; filaments filiform. *Achenes* few, '12 in. long, sharply 8-ribbed.

KHASI HILLS, 3-6,000ft., e. g., Borpani, Happy Valley, Nongbri, etc.

The root is good for fever and eye diseases and is used in the form decoction, extract or powder. In the last named form it is known as *Suema mamira* in Kashmir.

Fls. Rainy season.

3. *Thalictrum javanicum*, Bl.

Stem erect, 2-3ft. high, glabrous. *Leaves* several times ternately decomposed; leaflets '2-8in. diam., ovate or orbicular, membranous, glabrous, somewhat glaucous beneath, 3-7-toothed; base, rounded or cordate. *Panicle* laxly branched; stipules adnate, imbricate. *Flowers* about '2 in. long, white, on filiform pedicels '4-6 in. long; filaments club-shaped. *Achenes* up to 15, about '25 in. long, strongly ribbed; beak short.

KHASI HILLS, 5-6000 ft.

May be used as a substitute for *T. foliolosum*.

Fls. 7-9.

5. RANUNCULUS, Linn.

Annual or perennial herbs generally gregarious in habit. *Leaves* simple, lobed or dissected; petiole sheathing; stipules membranous or 0. *Flowers* paniced, or single. *Sepals* 3-5, imbricate in bud, caducous. *Petals* usually 5, often with a nectary near the base. *Stamens* many, *Carpels* numerous; styles very short; ovule 1, ascending. *Fruit* generally a head of beaked or apiculate achenes.

An aquatic herb. Flowers small not paniced.

Receptacle of achenes hairy.

... 1. *R. scleratus*.

Terrestrial herbs:—

A much-branched diffuse herb. Flowers solitary, Receptacle small, elongated, not hairy.

... 2. *R. diffusus*.

A sparingly branched tall herb. Flowers laxly paniced. Receptacle small, pilose.

... 3. *R. pensylvanicus*.

1. *Ranunculus scleratus*, Linn.

An annual herb, 1-2 ft. high, generally growing along the edge of water, stem fleshy, hollow, usually glabrous, *Radical leaves* 3-partite, segments cuneate; cauline sessile. *Flowers* '5-6 in. diam. *Sepals* as long as the petals reflexed. *Receptacle* '5 in. long, hairy. *Achenes* about '1 in. long, with a continuous intermarginal ridge all round.

Goalpara, W. R. Fisher

This plant has an acrid juice and is used for medicinal purposes.

2. *Ranunculus diffusus*, DC.

A perennial diffuse or prostrate herb with spreading hairs and fibrous roots, often shooting from the nodes. *Leaves* 3-partite, softly hairy; segments cuneate. *Flowers* 1-1.5 in. diam., solitary on terminal or leaf-opposed peduncles 1-2 in. long. *Sepals* hirsute, smaller than the petals. *Petals* white or yellow. *Receptacle* small. *Achenes* compressed, cuneately sub-orbicular, margined.

KHASI HILLS, G. Mann! 5, -6,000 ft.

3. *Ranunculus pensylvanicus*, Linn.

An erect or prostrate plant 2-3 ft. long. *Radical leaves* 3-foliate, long-petioled, leaflets 3-partite deeply cut into linear segments; cauline with petioles of decreasing lengths, the uppermost being sessile. *Flowers* about 1 in. long. *Sepals* reflexed, hirsute. *Receptacle* pilose. *Achenes* compressed, with an intramargined ridge.

A weed of rice-fields in the KHASI HILLS and the plains of ASSAM.

6. DELPHINIUM, Linn.

Delphinium altissimum, Wall. Vern. *Rad-sohplih-rit*, Khasi.

Stem 2-4 ft. much branched. *Leaves* few, palmately lobed, 5-7 fid; segments broadly cuneate, 3-lobed, coarsely toothed, few-nerved, sparsely hairy above, ciliate along the nerves beneath, cauline 3-lobed, or entire; petiole up to 1 ft. in length. *Flowers* 1-1.5 in. long including the spur, in lax racemes, irregular, purple or lurid-blue, very foetid; pedicels 1-2 in. long; bracts and bracteoles linear. *Sepals* 5, golden-hairy, strongly ciliate, dorsally spurred behind; spur 6-8 in. long, subulate, incurved. *Petals* 4, the two dorsal with long slender spurs within the spur of the dorsal sepal; anterior petals 2-lobed, hairy. *Stamens* many; filaments about 3 in. long, glabrous. *Fruit* of 3 pubescent follicles.

KHASI HILLS, 5,500-6,000 ft., e. g., Mawphlang, Sohiong, etc.

Coptis Teeta, Wall.

A stemless herbaceous plant of this Family which grows in the temperate regions of the Mishmi Hills and yields the drug *Mishmi-tita* much used in Bengal and elsewhere. The roots are gathered towards the end of the rainy season and are carried in tiny little wicker baskets to Sadiya where dealers from other provinces go to buy them.

Many other medicinal plants, such as *Aconitum*, *Pulsatilla*, *Cimicifuga*, etc., belong to this Family, but they do not occur in Assam.

FAM. 2. DILLENIACEÆ.

Trees or climbing shrubs. *Leaves* simple, alternate, ex-stipulate, close and parallel-veined, generally rough and hard. *Sepals* 5, broadly overlapping, persistent. *Petals* usually 5, rarely 2-4, deciduous. *Stamens* numerous. *Carpels* 1 or 5-20, in the latter case generally cohering in the axis; ovules 100 or few or many, attached to the ventral suture. *Fruit* follicular or baccate. *Seeds* arillate, albuminous; embryo minute.

Climber. Fr. dry, of 1 carpel and 1 seed. 1. *Delima*.
Trees. Fr. fleshy, of 5-20 many-seeded carpels. 2. *Dillenia*.

1. DELIMA, Linn.

Delima sarmentosa, Linn. Vern. *Ou-lota*, *Oua-lota*, *Pamilewa* Ass.; *Bau-taruk*, Daff.; *Samphot-rikang*, Mik. *Aithlang shrui*, Kuki; *Hruisen*, Tipp.; *Tieydi-douka*, Cach.

A harsh evergreen climber. Stem cinnamon coloured, exfoliating in square or rectangular pieces. L. 3-6 by 2-2.5 in. elliptic or oblong, more or less cuneate at base, scabrid on both surfaces, unchanged in colour when shed; pet. 6-8 in. long, pilose, channelled; lateral nerves 14-16 pairs, almost straight and parallel, depressed above, raised beneath. *Flowers* white, in terminal panicles. *Sepals* reflexed. *Petals* obovate, ciliate. *Ovary* of one carpel only. *Follicle* 1-seeded. *Seed* arillate.

Common in evergreen forests throughout the province.

The stem quickly cut into pieces gives copious and wholesome potable water. The leaves can be used as a substitute for sand-paper in polishing wood, horn or ivory.

Fls. 5-7. Fr. 7-9.

2. DILENIA, Linn.

Trees with large leaves crowded at the ends of branches. *Flowers* large, white or yellow, more or less scented. *Sepals* 5, persistent, much thickened in fruit. *Petals* 5. *Anthers* opening by terminal slits or pores. *Fruit* of 5-20 carpels cohering in the axis, enclosed in the thickened sepals. *Seed* generally immersed in pulp.

- I. Each pedicel bracteate about the middle. Leaves flat:—
Fls. white, solitary, 6-8 in. diam. Fr. 3-5 in. diam. ... 1. *D. Indica*.
Fls. yellow, fasciated, not exceeding 2-5 in. in diam.
Fr. less than 1 in. in diam. ... 2. *D. scabrella*.
 - II. Individual pedicels ebracteate (fascicles of them bracteate only at the base). Leaves V-shaped in transverse section. ... 3. *D. pentagyna*.
1. *Dillenia indica*, Linn. Vern. *Ou-tenga*, *Panchkol*, Ass.; *Chalta*, *Chalita*, Beng.; *Sompa*, *Sampa*, Miri; *Chumpa*, Abor; *Pumplang*, Mik.; *Thegdi bapahng*, *Thaidi*, Cach.; *Bau-changne*, Daff.; *Aithlong*, Lushai; *Aitrang* Kuki; *Aitang*, *Jongphang*,

Tipp.; *Hiegri*, Manip.; *Thagit*, Mech. *Dieng-soh-karbam*, Kh. *Dong-phang-thai*, Naga:

An evergreen tree up to 60 ft. in height and 6 ft. in girth, often fluted or buttressed at the base, with a large oval crown. *Bark* cinnamon coloured or reddish-grey, peeling off in more or less papery and fragile flakes reddish inside with fine and close veins of deeper red. *Leaves* 6-12 by 3-5 in., petioled, oblanceolate or narrow-elliptic, more or less V-shaped in transverse section, glabrous above, pubescent beneath, sharply serrate: lateral nerves. 30-40, very prominent beneath making a narrow angle with the midrib. *Flowers* 6-8 in. across. *Petals* white, very tender. *Fruit* 3-5 in. in diam., always green, with 16-20 carpels tightly enclosed inside the much-thickened sepals. *Seeds* compressed.

Very common and often gregarious in damp places and round swamps in all Districts.

Wood reddish-brown, elastic. The timber is considered very good for fire, poles and is durable under water. The fruit (fleshy calyx) is eaten raw or cooked and also used medicinally.

Fls. 6-8, Fr. 2-4.

2. *Dillenia scabrella*, Roxb. Vern. *Banji-ou*, Ass. *Mandiphang* or *Munde-phang*, Kach.; *Chirimso*, Mik. *Mangie-thing*, Kuki; *Agatchi-badura*, Garo.

A deciduous tree up to 50 ft. in height and 5 ft. in girth with a fluted trunk and more or less horizontal branches. *Bark* brown and rather rough outside, light-pink inside with rather coarse brownish radial veins, turning darker brown after exposure. *Leaves* 8-15 by 4-7 in., flat, oblanceolate to elliptic, cuspidate-serrate, rather membranous for the genus, hispid above, harshly pubescent beneath; lateral nerves 25-40, often almost horizontal, slightly arcuate; base acute; petiole winged, dilated at the base to clasp the stem. *Flowers* 1.5-2.2 in. across, appearing shortly before the leaves; pedicels 2-2.5 in. long, 3-bracteate about 1 in. above the base. *Sepals* concave, translucent, cohering at the base, nearly glabrous, palegreen. *Petals* 8-12 by 4-6 in. golden-yellow. *Fruit* globose, about 8 in. across, pale-green, with 5-7 carpels.

Foot of the MIKIR HILLS, Doiguring Reserve in SIBSAGAR; Dhansiri Reserve also Sildharampur in NOWGONG.

Wood light reddish-brown, rather light, moderately hard, not much used. The fruit is eaten.

Fls. 3-5, Fr. 5-7.

Dillenia pentagyna, Roxb. Vern. Generally the same as of the preceding species. *Akshi*, *Okshi*, *Oua*, Ass.; *Tantri*, *Tatera*, Nep.; *Chirimpi*, Mik. *Bonchotta*, Cach.; *Dieng-sah-bar*, Kh.

A deciduous tree about 50 ft. in height; branches generally ascending; branchlets marked with V-shaped leaf scars. *Bark* greyish-white outside, green underneath the corky layer, light red inside, finely purple-veined. *Leaves* 12-40 by 4-12 in., oblanceolate, very narrow at the base which is often stem-clasping, serrate, coriaceous and hard, glabrous above, glabrescent beneath; lateral nerves up to about 40, almost straight, making an angle of about

50 degrees with the midrib, tertiary nerves very fine, sub-parallel; petiole short or 0. *Flowers* about 1.5 in. across, in fascicles of 3-8 from short bracteate protuberances, appearing before the leaves; pedicels .8-1.5 in. long, without any bract. *Sepals* broadly ovate, concave, pale-green, glabrate, slightly ciliate. *Petals* about 1 in. long, obovate, light greenish-yellow. *Fr.* .6-.8 in. in diam., of 5 carpels (whence the specific name).

A characteristic tree of deciduous forests, therefore rather scarce in UPPER ASSAM, which area it just touches by occurring along the foot of the MIKIR HILLS, e.g., Lumding, Barpathar, Kukrakata, etc.

Wood reddish-grey, moderately hard and fairly durable, but is liable to warp and crack, hence not much used. The fruit is eaten. In Western India the leaves are used as a substitute for thatching grass. They might be so used in parts of Assam also where thatching grass is scarce.

Fls. 3-5. Fr. 5-7.

FAM. 3. MAGNOLIACEÆ.

Trees, shrubs or climbers, more or less aromatic. *Leaves* simple, alternate, usually entire, generally with stipules which leave a transverse scar on the branchlets. *Flowers* solitary, generally showy. *Sepals* and *petals* similar, deciduous, arranged in whorls of 3. *Stamens* many. *Carpels* many, arranged often spirally on an axis which generally elongates as the fruit ripens.

- I. Trees with large but caducous stipules. Carpels spirally arranged on an axis :
 - A. *Flowers* terminal (axillary in *Talauma phellocarpa*) with little or no interval bet. stamens and carpels :—
 - Carpels persistent on the axis :—
 - Carpels separate, each with 2 ovules. ... 1. *Magnolia*
 - Carpels co-hering, each with 6 or more ovules. ... 2. *Manglietia*.
 - Carpels separating from the axis, with 2 ovules in each :—
 - ... 3. *Talauma*.
 - ... 4. *Pachylarnax*
 - Carpels concrescent with 2 ovules in each cell ... 5. *Michelia*.
 - B. *Flowers* axillary with a distinct interval between stamens and carpels : ovules 2-6 in. each carpel. ... 6. *Illicium*.
- II. Shrubs without stipules. Carpels in only one whorl, each with 2 ovules ... 7. *Schizandra*.
- III. Climbers without stipules. Carpels with 2 or more ovules :—
 - Carpels in fruit distant forming a long spike ... 8. *Kadsura*.
 - Carpels in fruit closely packed forming a globose head. ...

1. MAGNOLIA, Linn.

Generally trees. *Leaves* entire; buds enclosed in large convolute stipules which are connate in pairs. *Flowers* terminate usually large. *Sepals* 3, as a rule not brightly coloured. *Petals* 6-12, in series of 3. *Stamens* numerous, filaments flat, with little or no interval between them and the carpels. *Carpels* many, persistent 2-ovuled, the stigmas running down along their ventral

suture. *Fruit* with an elongated axis. *Seeds* pendulous with a long cottony cord, only.

Leaves large, generally 9-16 in. long, very closely reticulate, hairy at least when young:—

Leaves very coriaceous glabrous when mature, pet. long with a narrow V-shaped scar; sepals and petals broad. . . .

. . . 1. *M. pterocarpa*.

Leaves moderately coriaceous, felted-tomentose beneath; pet. short, channelled; sepals and petals narrow. . . .

. . . 2. *M. Griffithii*.

Leaves medium-sized, 6-9 in. long, chartaceous, generally glabrous:—

Leaves elliptic, glabrous and green beneath, petiole at least 1 in. long. . . .

. . . 3. *M. sphenocarpa*.

Leaves oblong, glabrous when mature, petiole scarcely 3 in. long. . . .

. . . 4. *M. Pealiana*.

Leaves small, 4-6 in. long, thinly chartaceous, quite glabrous, very closely reticulate, pet. short. . . .

. . . 5. *M. Gustavi*.

1. *Magnolia pterocarpa*. Roxb Vern. *Thouthua*, Ass. (N. Lakh.) *Baramphuri-sopa*, Ass.; *Doloi-champa*, Cach; *Utham-ban*, Manip.; *Phapitemhaija*, Kuki; *Lairouthou-buphang*, Cach.; *Chapite-jamja*, Tipp. and Kuki; *Thang-Ksem*, Dieng-long-krop, Dieng-soh-bar-synrang, Dieng-soh-dkhar, Khasi.

A middle-sized ever-green tree generally with a large crown, branchlets green, annulate. *Bark* grey, rough with warts, inside fibrous, light brown with distant white streaks, soon turning dirty-brown, 5-7 in. thick. *Leaves* 9-16 by 5-7 in., elliptic or obovate, very coriaceous, felted rusty-tomentose beneath while young, glabrous and shining above, young light-green, old pale-yellow; lateral nerves 20-25 on either side, raised underneath, tertiaries raised on both surfaces (rather depressed above when green), closely reticulated in crocodile pattern; base cuneate; petiole 1.2-2 in. long, flattened above with a narrow V-shaped scar; stipules 4-5 in. long, caducous, adnate by their edges to the petiole, greenish-white, grey-canescens, with a tuft of hairs at the apex. *Flowers* 5-6 in. across; buds ovoid, 2-2.5 by 1.5 in., enveloped in a concave coriaceous puberulous caducous bract, *Sepals* 3, 3 by 2 in. very concave, green outside, greenish-white inside. *Petals* 6, dull-white very fleshy but with a sharp margin, aromatic, gradually smaller but scarcely narrower inwards obovate, emarginate. *Stamens* very numerous with no interval between them and the carpels, together forming a continuous conical mass 1.5 by 1 in.; anthers long with purple tips. *Stigmas* feathery. *Fruit-spike* 6-10 by 2-2.5 in. *Mature carpels* with a recurved terminal wing 1-1.7 in. long; axis much thickened and somewhat spongy. *Seeds* orange.

North Lakhimpur and Charduar. Somewhat rare in Upper Assam but possibly generally mistaken for *Talauma Hodgsoni* which it closely resembles in foliage.

The wood is white, rather soft and even-grained and suitable for tea-boxes. It is considered excellent as fire wood in N. Lakhimpur. The stipules, while

tender, are chewed to blacken the gums and teeth in the same way as those of *Talauma Hodgsonii*.

Fls. 4-5. Fr. 10-12. L. renewal 10-12.

2. *Magnolia Griffithii*, Hk. f. & Th. Vern. *Gauri-sopa*, *Gahori-sopa* or *Bar-gahori-sopa* Ass. (Lakh. and Darr.); *Pansopa*, *Kola-sopa*. Ass. (Sibs.); *Lakap*, Naga.

A middle-sized tree with a more or less oval crown; branchlets thickly rusty-pilose. *Bark* grey, fairly plain but with shallow horizontal wrinkles and fine vertical fissures, dark-brown and fibrous inside, turning darker brown after exposure about .5 in. thick. *Leaves* 6-12 by 4-6 in., elliptic thinly coriaceous, glabrous and somewhat shining and very finely reticulate above, densely felted tomentose and often variegated beneath; lateral nerves 20-28 on either side, straight or very slightly arcuate, base gradually or suddenly cuneate, petiole .3-.5 in. long, hairy channelled. *Flowers* about 6 in. across pale-white faintly scented; buds enclosed in silky scales 2 by .8 in., oblong silky on silky peduncles 1.2-1.8 in. long. *Sepals* 3. *Petals* 6, 2.5-3 by .8-.3 in.; fleshy, brittle creamy-white or pale-yellow. *Stamens* about 90, crowded a little below the carpels which are adpressed in fl. and form a cylindrical column. *Carpels* about 110, styles slender and slightly recurved. *Fruit-spike* 5-10 by 1-1.2 in.; carpels speckled when mature, compressed, 1-2-seeded, scarcely woody; axis scarcely thickened. *Seeds* reddish-brown.

Fairly common in the evergreen forests of LAKHIMPUR, SIBSAGAR and DARRANG DISTRICTS.

The wood is greyish-brown, rather soft and light, not used for timber.

Fls. 4-5. Fr. 11-1.

3. *Magnolia spheocarpa*, Roxb. Vern. *Pansopa*, Ass. (Sibs.) *Parokbithi-arong*, Mikir.

An evergreen tree up to 70 ft. in height and 5 ft. in girth. *Bark* grey, fairly smooth, with very fine vertical fissures and shallow horizontal wrinkles, inside brown and mottled, soon turning dirty green, aromatic. *Leaves* 8-12 by 4-6 in., aromatic, elliptic, membranous, quite glabrous, shining above; lateral nerves 10-12 on either side with often a few intermediate ones, tertiaries finely and closely reticulate; base rather suddenly cuneate; petiole 1-1.2 in. long channelled swollen at the base, with no V-shaped scar; stipules about 2 in. long, hairy at the tip.

The above description refers to my No. 3887 which was identified at Sibpur as this species. Sir George King, however, has made *M. spheocarpa* Roxb., synonymous with *M. pterocarpa* Roxb., but if the Sibpur identification of my specimen is correct, the two trees must be kept distinct. My specimen agrees exactly with Mr. Haines' No. 505 from Lower Tondou, W. Duars. Unfortunately I have seen no flower or fruit.

Barpathar, SIBSAGAR.

4. *Magnolia Pealiana*, King. Vern. *Gahori-sopa*, Ass. (Lakh.) Apparently a middle-sized tree; young shoots hairy. *Bark*

dark-grey with longitudinal wrinkles. *Leaves* 6-10 by 2-3 in., oblong or oblanceolate, suddenly acuminate, chartaceous, glabrous and shining above, pubescent on the midrib and nerves beneath; lateral nerves about 18 on either side often with shorter intermediate ones, reticulations much closer and finer than in the preceding species; base cuneate or rounded; petiole 2-3 in. long, channelled, stipules 1-25 in. long, strap-shaped with a subulate tip, pale-yellow, silky. *Flowers* solitary, leaf-opposed, 3-4 in. across, on a yellow-silky pedicel 1-5-2 in. long; buds oblanceolate in outline; involucre covered with yellow silky hairs. *Sepals* 3, oblong, coriaceous with undulate margins near the apex. *Petals* 6, oblong or oblanceolate, coriaceous, smaller than the sepals. *Stamens* 5 in. long; filaments about one-tenth the length of the sharply pointed anthers; gynæcium cylindrical with a short stalk above the stamens. *Fruit* 3-5 in. long; carpels 6 by .45 in., 2-seeded, slightly speckled outside.

Makum Forest, LAKHIMPUR. Mann.

The wood is white throughout, soft and even-grained, light but fairly strong.

5. *Magnolia Gustavi*, King. Vern. *Khorokia-sopa*, Ass. (Lakh.)

An evergreen tree 70 to 80 ft. in height and 5 to 6 ft. in girth, closely resembling *Talauma phellocarpa* in habit and foliage. *Leaves* 5-8 by 1-2-2 in., elliptic-lanceolate, acute, chartaceous, quite glabrous; main lateral nerves 14-16 on either side, reticulations very fine and close; base acute; petiole 3-5 in. long. *Flowers* 3-4 in. across, terminal and axillary, solitary, on peduncles 1-5-2 in. long; buds 1-5 in. long, oblong-ovoid; bracts ovoid, smooth, coriaceous. *Sepals* 3, oblanceolate, membranous. *Petals* 6, of the size and shape of sepals, coriaceous. *Stamens* about 6 in. long, not very numerous, with no interval between them and the carpels. *Carpels* sessile, suborbicular, smooth, dorsally compressed when young, 6-7 in. long when mature, not beaked. *Young fruit* club-shaped.

Makum Forest. LAKHIMPUR.

2. MANGLIETIA, Bl.

Some characters as of *Magnolia* excepting that the *leaves* are generally more laxly veined, the *gynophore* is always sessile, the carpels are more congested and cohering, and with 6 or more ovules in each carpel. Scar of stipules is always present on the petiole and is of the shape of a narrow U.

Large trees. Leaves at least thrice as long as broad, generally finely acuminate, pale beneath; petiole stout:—

Fruit-spike ovoid-oblong. Leaves lanceolate.
Fruit-spike globose-ovoid. Leaves oblanceolate. ...

1. *M. Caveana*.

2. *M. Hookeri*

Middle-sized tree. L. not more than twice as long as broad, obtuse or suddenly obtusely acuminate, glaucous beneath petiole slender.

3. *M. insignis*.

1. *Manglietia insignis*, Bl. Vern. *Pan-sopa* *Phul-sopa*, Ass. (Lakh. and Sibs.). *Dieng-rhi-basaw*, also *Dieng-rhi-balih*, Khasi ; according as the flowers are pink or white.

An evergreen tree 80-90 ft. high and 5-7 ft. in girth. *Bark* plain, greyish white to reddish brown outside with faint vertical fissures and fine horizontal wrinkles, green underneath the thin layer of cork. fibrous, inside dirty-brown, faintly mottled, soon turning darker brown. *Leaves* 6-9 by 2-3 in., elliptic-lanceolate, generally thickly coriaceous, quite glabrous ; main lateral nerves about 18 on either side alternating with shorter ones ; main reticulation lax, raised on both surfaces in dry but impressed above in green leaves ; base acute or cuneate ; petiole 1-2-1-6 in. long, more or less stout. *Flowers* 4-6 in. across scented. *Sepals* 3, 3 by 2 in., pink. *Petals* 9, white, gradually narrower towards the centre, very fleshy. *Anthers* sessile or nearly so. *Carpels* slightly beaked, warty, each with about 6 ovules. *Fruit* narrowly ovoid or almost cylindrical, 3-5 in. long. *Seed* red, faceted, suspended by a very slender cord.

Fairly common in evergreen forest along the foot of the Naga Hills in LAKHIMPUR to Geleki and in the Diroi Reserve in SIBSAGAR. Also near Gagaldhubi, in N. LAKHIMPUR, and Pabhoi in DARRANG ; *KHASI HILLS* below 2,500 ft.

The wood is yellowish-white, even-grained and smooth and takes a very fine satiny polish. It is very good for indoor work.

Fls. 5-6. Fr. 910.

Var. 1. *LATIFOLIA*. Leaves shorter but rather broader than in the type, acute.

Occurs in the same localities and has the same vernacular names.

2. *Manglietia Hookeri*, Cubitt and Smith, Rec. Bot. Surv. Ind. IV. 273. Vern. *Pansopa*, *Phulsopa*, Ass. (Lakh. and Sibs.)

Apparently a large tree ; young parts rufous-silky. *Bark* grey outside, fairly smooth, light brown and fibrous but soft inside, 7-9 in. thick. *Leaves* 6-8 by 2-2-5, elliptic or oblanceolate, finely acuminate, membranous or very thinly coriaceous, minutely ferruginous-pubescent beneath when young, glabrous when mature ; main lateral nerves 10-14 on either side, very slender, with a few more slender intermediate ones ; reticulations inconspicuous in green, but distinct and slightly raised on both surfaces in dry leaves ; base acute ; petiole rather slender 1-1-5 in. long ; stipules 2-3 in. long lanceolate, brown-silky outside. *Flowers* 5-6 in. across, scented. *Sepals* 2-5-3 by 3 in., oblanceolate, green tinged with pink. *Petals* white, soon turning pale-yellow. *Carpels* with 3-4 ovules. *Fruit* 2-3 by 1-5-2 in., ovoid ; carpels without beak.

Evergreen forests of LAKHIMPUR and SIBSAGAR from Makum to Sapakathi. Fls. and new lvs. 2-3 Fr. 6-7.

The heart wood is greenish-brown, fine and even-grained, fit for furniture and indoor work. It is said to be very durable.

3. *Manglietia Caveana*. Hk. f. and Th. Vern. *Pansopa*, *Phul-sopa*, Ass. (Lakh. and Sibs.) ; *Larsei-Kynthei*, Khasi.

Generally a middle sized tree with ashy-grey fairly smooth bark green underneath the corky layer, inside dirty-brown and faintly mottled, 3 in. thick. *Leaves* crowded at ends of branchlets, 4-9 by 2.2-3.5 in., broadly or oblong-elliptic, finely acute or bluntly acuminate, chartaceous, shining above, more or less glaucous beneath, main lateral nerves 10-15 on either side, almost regularly alternating with shorter intermediate ones slightly arcuate; midrib depressed above, prominent beneath reticulations close, distinct in dry, but somewhat indistinct in green leaves; base rounded or obtuse; petiole 1.3-1.5 in. long; stipules very sparingly rusty-silky pubescent. *Flowers* 4-6 in. across, scented. *Sepals* 3, dull-red with green veins, 2-3 in. long. *Petals* 9, gradually narrower, white, fleshy. *Anthers* sessile. *Carpels* congested, each with about 6 ovules, not or very slightly beaked when mature. *Fruit* narrowly ovoid; seeds faceted, red.

Jaipur and similar localities in LAKHIMPUR; Sapekathi and Abhaipur Reserve in SIBSAGAR; also KHASI HILLS upto 2300ft.

Wood appears to be soft, not used as timber.

Fls. 2-3, Fr. 6-7.

3. TALAUMA, Juss.

Generally trees. *Leaves* entire; buds enclosed in large convolute stipules. *Flowers* terminal. *Sepals* 3. *Petals* in whorls of 3. *Anthers* linear, introrse. *Gynophore* sessile. *Carpels* indefinite, each with 2-4 ovules, woody or corky when mature, finally separating from the axis; seeds suspended by an elastic cord.

Carpels not confluent, woody. *Leaves* glabrous.

Sepals and *petals* broad and fleshy:—

A small tree. *Sepals* and outer whorl of *petals* never fully expanded. ...

1. *T. Hodgsoni*.

A tall tree. *Sepals* and outer whorl of *petals* reflexed when flower is fully open. ...

2. *T. Rabaniana*.

Carpels confluent externally, spongy. *Leaves* adpressedly grey-pilose beneath. *Sepals* and *petals* narrow, not fleshy. ...

3. *T. pfiellocarpa*.

1. *Talauma Hodgsoni*, Hk. f. & Th. Vern. *Boromthuri*, *Boron-thuri*, Ass.; *Dat-bhola*, Ass. (Charduar); *Dieng-soh-pydem*, Khasi; *Tetere-asing*, Miri.; *Burbang-asing*, Abor; *Boron-thari-arong*, Mik.; *Laigerau*, Kach.; *Laigungron*, Mech.

A small tree with a few spreading branches. *Bark* greenish, grey, warty, otherwise smooth, with distant horizontal wrinkles, often with large white patches; inside brownish-yellow, fibrous, 2-3 in. thick. *Leaves* 8-20 by 4-8 in., oblanceolate, rounded or suddenly apiculate, thinly coriaceous, quite glabrous, red and erect when young; secondary nerves 15-25 on either side, almost straight, tertiaries more or less transverse to the secondaries, quaternaries reticulate; base very acute; petiole 1.2-2.5 in. long, terete, with a faint scar of fallen stipules, much swollen at the base. *Flowers* large, terminal. *Sepals* greenish-purple. *Petals* greenish-white at base, bright-red above. *Filaments* short. *Fruit* ovoid, 4-6 by 2.5-3.5 in. *Carpels* beaked, woody, dehiscent by the ventral suture, separating from the axis leaving the red seeds

attached to it at the upper end of the empty pits by an elastic cord.

Fairly common in the evergreen forests of all the DISTRICTS of UPPER ASSAM.

The wood is grey, soft, light and even-grained.

It is used for handles of knives, etc., in Darjeeling, but only as firewood in ASSAM. The stipules are chewed by young girls to blacken their teeth and gums.

Fls. and new leaves 4-5. Fr. 8-9.

2. *Talauma Rabaniana*, Hk. f. & Th. Vern. *Sopa*, Ass.; *Lai-makhan-phang*, Kach.; *Kobaraiching*, Naga.

A tall tree with a conical crown attaining 70 ft. in height and 6 ft. in girth, closely resembling *T. Hodgsoni* in general appearance, young parts fugaciously tawny-tomentose. *Bark* 5-7 in. thick, dark-grey and rough outside, fibrous and uniformly pale-brown inside. *Leaves* 8-14 by 2-4 in., elliptic or oblanceolate, shortly acuminate, gradually narrowed to the base, coriaceous, dark-green and shining above light-green underneath; midrib stout; lateral nerves 12-24 on either half, nearly straight; reticulations fine and close. *Flowers* solitary, terminal, 2-3 in. long; peduncles about 1 in. long and 4-5 in. thick, annulate; bracts densely adpressed tomentose. *Sepals* 3, sub-orbicular, rough outside, caducous. *Petals* 9 in three whorls, broadly elliptic or obovate, concave, the outer whorl reflexed after the fall of the sepals. *Filaments* very short; anthers 6-7 in. long. *Fruit* about 3-6 in. long and 1.5-1.8 in diam.; carpels not so numerous as in the last species, woody, dehiscent by the ventral suture; axis woody; pits somewhat shallow, rhomboidal.

GARO, KHASI and NORTH CACHAR HILLS upto 4,000 ft., also near Patgaon in GOALPARA.

The timber is greyish white and moderately hard, weighing about 30 lb. per c. ft. It is suitable for furniture and planking.

Fls. 4-6. (?)

3. *Talauma phellocarpa*, King. Vern. *Khorika-sopa*, *Tita-sopa*, Ass. (Lakh. & Sibs.); *Dieng-lari*, *Dieng-rewi*, Synt.; *Karo-phang*, *Dauthu-kundu-phang*, Kach.; *Champa*, Cach.; *Bol-mring*, Garo; *Langlu-chikong-arong*, Mik.

A large evergreen tree up to 100 ft. in height and 8 ft. in girth, with grey pubescent branchlets which are gracefully pendulous in mature trees; crown narrow and conical till full height is attained, oval afterwards. *Bark* ashy-grey, somewhat rough, exfoliating in rectangular flakes; inside fibrous, yellowish tan-brown, mottled with coarse strands of amber-brown, soon turning darker tan-brown, 4-5 in. thick, aromatic, bitter. *Leaves* 3-8 by 1.2-2 in., elliptic lanceolate or oblong-lanceolate, acute or acuminate, thinly coriaceous, glabrous and shining above, densely grey-pilose beneath when young, glabrescent when mature, pale-yellow before falling; main lateral nerves about 14 on either half, slender, straight or more or less arcuate, reticulations very close

and fine, base acute; petiole 4-7 in. long, pubescent; stipules 4-6 in. long, brown-silky outside; scar inconspicuous. *Flowers*: axillary, solitary, erect, pale-white, about 1 in. across; buds ovoid-elliptic, 5-7 in. long, enclosed in silky scales; peduncles 4-5 in. long, jointed about the middle. *Sepals* and *petals* 12, narrow-lanceolate to strap-shaped, pale-white. *Fruit-spike* continuous, 3-4 by 12-14 in., speckled with large grey corky lenticels, aromatic, somewhat bumpy indicating the position of the carpels which ultimately fall off leaving empty oval cavities and falcate stalks attached to the persistent axis.

Fairly common in the LAKHIMPUR and SIBSAGAR DISTRICTS from Makum to the Dirol Reserve; also found in the MIKIR HILLS and in the Dhansiri Reserve, NOWGONG; KHASI HILLS upto 4000ft; CACHAR and GARO HILLS.

The tree has a large heartwood of a greenish-brown colour turning darker brown when dry. It takes a good polish and is used for planking, doors and windows and furniture. Annual rings marked by a very fine ring of softer tissue.

Fls. 5-7. Fr. 7-9. Occasionally flowers and fruits out of season.

4. PACHYLARNAX Dandy.

Pachylarnax pleiocarpa, Dandy. Sp. nov. Vern. *Phulsopa*, Kothaipathia *sopa*, Ass.

A large evergreen tree, young shoots dark green, tubercled. *Bark* rough with longitudinal furrows. *Blaze* brownish yellow marked with dark dots. *Leaves* alternate, somewhat crowded towards the ends of branches 6-9 by 2-3 in. elliptic-oblong to oblanceolate oblong, entire, obtuse or rounded, rarely subacuminate, sometimes slightly emarginate, thickly coriaceous, shining, green above, pale beneath, glabrous; lateral nerves 10-18 on either half, conspicuous, midrib prominent beneath; nerves laxly reticulate, base cuneately attenuate, occasionally unequal; petiole 1-12 in. long, thick, flattened above (not channelled); stipules deciduous, elliptic-oblong. *Flowers*: fragrant, generally solitary, rarely in pairs, about 4 in. across; flower buds lanceoloid or narrowly ovoid-oblong, covered by 1-3 deciduous bracts; peduncles thick, 8-12 in. long. *Perianths*: 4-5-merous; tepals 13-15, fleshy, whitish yellow or cream coloured, 4-5 outer ones oblanceolate or narrow elliptic-oblong, 9-10 inner ones spatulate, smaller towards interior. *Stamens*: numerous (53-57), 5-8 in. long; filaments short; anther cells produced into a short acute appendix, gynæcium ellipsoid; carpels concrescent, 5-8; ovules 4-8 in each carpel. *Fruit*: capsular, woody, ellipsoid, 3-4 by 3 in., dorsally dehiscent, upper most separating from the conical central axis, each valve being composed of united halves of 2 adjacent carpels. *Seeds* about 3 in. across, with an orange coloured fleshy coat.

LAKHIMPUR (Digboi, Upper Dehing and Jaipur Reserves).

Wood moderately hard, takes a fine polish and is very valuable for cabinet work.

Fls. 10-12. Fr. 8-9 (persists long on the tree).

E. Dandy in the *Journal of Botany*, November, 1933.)

5. MICHELIA. Linn.

Evergreen trees. *Leaves* enveloped by stipules in bud with prominent reticulate veins, generally bitter and aromatic. *Flowers* axillary (terminal in *M. Callicartii*), solitary, with sepals and petals similar and in whorls of 3. *Filaments* flat, with a distinct interval above them and below the carpels, anthers introrse. *Carpels* terete or compressed, usually white-speckled, contiguous in flower but generally distant in fruit owing to elongation of the axis, dehiscent dorsally, each with 2-4 ovules, but mostly 1-seeded in fruit. *Styles* short.

1. Carpels numerous :—

A. Flowers mostly terminal.

Leaves 5-5 by 1·5-2 in.,
chartaceous, glabrous except
the midrib, lateral nerves
10-15 on either half. Fruit-
spike 3-5 in. long; ripe
carpels compressed, congested.

... 1. *M. Callicartii*.

B. Flowers axillary :—

1. Young parts hairy :—

a. Leaves more or less pubescent beneath. Young parts densely ferruginous-tomentose :—

Leaves 5-8 by 2-3·5 in.,
thinly coriaceous; lateral
nerves 8-10 on either half.
Fruit-spike 5-8 in. long;
ripe carpels terete, rather
distant. ...

... 2. *M. excelsa*.

Leaves densely grey-tomentose
beneath, 6-10 by 2-3·5 in.,
sub-coriaceous; lateral
nerves up to 18 on each half.
Fruit-spike 2-5 in. long;
ripe carpels compressed,
stalked. Flowers pale-white,
not scented. ...

... 3. *M. lanuginosa*.

Leaves usually puberulous
beneath, 8-10 by 2·5-4 in.,
thinly coriaceous; lateral
nerves about 15 on either
half. Fruit-spike 4-8 in.
long; ripe carpels terete,
sub-sessile, rather distant.
Flowers pale-yellow, strongly
scented. ...

... 4. *M. Champaca*.

b Adult leaves glabrous :—

Leaves 2·5-6 by 1·5-3 in.,
chartaceous; lateral nerves
10-15 on either half, slender.
Fruit-spike 2-4 in. long;
ripe carpels much compressed,
orbicular, sessile. Flowers
pale-yellow, delightfully
scented. ...

... 5. *M. Kisopa*.

Leaves 3-6 by 1·5-2 in.,
thinly coriaceous; lateral

nerves 8-12 on either half.
Fruit-spike 2-4 in. long;
ripe carpels compressed,
obovoid

... 6. *M. punduana*.

2. All parts glabrous:—

Leaves 3.5-5 by 1.5-2.5 in.,
thinly coriaceous. Fruit-
spike 5-7 in. long; ripe
carpels terete obovoid
sessile, somewhat distant.

... 7. *M. oblenga*.

Leaves 5-7 by 3.5-4.5 in.,
coriaceous, strongly reticu-
late. Fruit-spike 5-7 in.
long; ripe carpels terete,
oblong, slightly apiculate.

... 8. *M. Mannii*.

II. Carpels few:—

Leaves 4-6 by 1.5-2.2 in.,
oblong-lanceolate, coriaceous,
glabrous, glaucous beneath;
lateral nerves 9-11 on either
half. Fruit-spike 2-4 in. long;
ripe carpels slightly com-
pressed, shortly beaked.

... 9. *M. manipurensis*.

Leaves 3-7.5 by 1.5-4 in., lanceolate,
thinly coriaceous, shining above, closely
but not very strongly reticulate; lateral
nerves 10-12 on either half. Fruit-spike
1.7-2 in. long; ripe carpels usually
only one, as long as the fruit,
obovoid, not terete.

... 10. *M. montana*.

1. *Michelia Cathcartii*, Hk. f. & Th. Vern. *Dieng-rai*, Kh.

A large evergreen tree; young branches silky-hairy; bark dark-grey. *Leaves* 3-5 by 1.5-2 in., lanceolate or oblong-lanceolate acuminate, more or less rounded at the base, quite entire, chartaceous, shining on both surfaces; midrib densely silky-hairy above, brown-pilose beneath; lateral nerves 10-15 on either half, very slender, tertiaries finely reticulate; petiole 2-3 in. long, slender, densely yellow-hairy; stipules 6-8 in. long, densely silky. *Flowers* white, mostly terminal, 3-4 in. diam.; buds oblong, rounded at both ends; peduncle 1 in. long. *Sepals* and *petals* 9 in 3 whorls, each 1.5-2 in. long. *Stamens* about 1 in. long, overtopping the carpophore; filaments one-fourth the length of the anthers. *Carpels* sessile, beaked and densely imbricate while young. *Fruit-spike* 3-5 in. long; ripe carpels 3-4 in. diam., sub-orbicular, compressed, closely lenticellate; seeds 2-3.

KHASI HILLS, e.g., Nong-ryng-koh. Also NAGA HILLS.

Wood compact and moderately hard, fit for planking and tea-boxes, weighing about 40 lbs. per c. ft. Annual rings distinct.

Fls. 3-5. Fr. Rainy season.

2. *Michelia excelsa*, Bl. Vern. *Dieng-rai*, Khasi.

A lofty deciduous tree. *Bark* 7 in. deep, dark-grey, corky outside with irregular lines of fat lenticels and with very fine horizontal wrinkles, inside uniformly dun-yellow but for a few deep-brown specks; fibres very fine. Young parts densely ferruginous-tomentose. *Leaves* 5-8 by 2-3.5 in., ovate-elliptic or oblong-lanceolate, acuminate, cuneate or slightly rounded at

the base, thinly coriaceous, glabrous and shining above, glaucous often minutely silky-puberulous underneath; lateral nerves 8-10 on either half, arched, tertiary veins very closely reticulate; petiole 5-1 in. long; stipules 1.5-2 in. long oblong-acuminate, silky outside. *Flowers* white, axillary, sometimes spuriously terminal, 3-4 in. diam., faintly scented. *Sepals* and *petals* 12, of the outermost whorls 3 by 13 in., gradually narrower towards the centre. *Stamens* about 50, shorter than the gynœcium; filaments 1 in. long. *Carpels* about 40, tipped with persistent recurved styles. *Fruit-spike* 5-8 in. long; ripe carpels 4-6 in. long, obliquely ovoid, shortly beaked; ovules 2-4 in each carpel, fascicled on a tubercle on the placenta, only 1-2 developing into seed in each ripe carpel, seeds red, faceted, oily.

KHASI HILLS, e.g., Lum-suiar near Dampêp and similar other localities—not common.

Sapwood small, white, soft; heartwood yellow when freshly-cut, afterwards turning brown. Medullary rays very numerous, mostly very fine, showing a satiny silver-grain on a radial surface. Weight about 35 lbs. per c. ft. The timber is remarkably durable and is very suitable for furniture and planking.

Fls. 4-5. Fr. Rainy season.

3. *Michelia lanuginosa*, Wall. Vern. *Dieng-lali*, Khasi; *Gogoi-champ*, Nep.

A fast-growing deciduous tree up to 90 ft. in height and 7 ft. in girth with a broad crown. *Bark* about 1 in. thick, rather plain, grey corky outside, dun-brown inside, the whole soon turning on exposure to deeper brown, very fibrous. Young parts including stipules and bracts covered with pale grey-tomentum. *Leaves* 6-10 by 2-3.5 in., oblong-lanceolate, acute at both ends or sometimes more or less rounded at the base, thinly coriaceous, glabrous and somewhat shining above, mattedly grey-tomentose beneath, turning yellow before falling; lateral nerves 14 to 17 on either half, slender, reticulations very close but distinct only on the upper surface; petiole 5-7 in. long, rather short, grey-tomentose; stipules oblong. *Flowers* pale-white, 2.5-3 in. diam., axillary, solitary on short stout hairy pedicels; bracts very densely grey-silky. *Sepals* and *petals* 1-1.5 by 2-3 in., oblanceolate. *Stamens* 60-70, much shorter than the gynœcium; filaments glabrous. *Carpels* about 45, very woolly; styles glabrous. *Fruit-spikes* 2-5 in. long; ripe carpels about 5 in. diam., shortly stalked, slightly compressed, densely lenticellate; seeds 1-3, faceted, deep-orange.

KHASI HILLS, 5,600 ft., e.g., Kynshi. Not very common.

Wood greyish-white, soft, weighing 30-35 lbs. per c. ft. Medullary rays fine and numerous. Might be used for planking.

Fls. 8-9. Fr. 9-11.

4. *Michelia Champaca*, Linn. Vern. *Champa*, Beng. & Hind.; *La-champa*, Synt.; *Tita-sopa*, Ass.; *Champari-phang*, Kach., *Serj-asing*, Miri; *Bol-nabat*, Garo; *Ching-kappa*, Naga.; *Shap*, Khasi

Usually a middle-sized evergreen tree up to about 70ft. in height. *Bark* ashy-grey or brownish, rather rough outside, inside light dun-brown with thick strands of amber brown tissue, soon turning reddish brown, 5-7 in. thick. *Leaves* 4-9 by 2-3½ in., lanceolate, sometimes ovate, finely acuminate, thinly coriaceous, glabrous and more or less shining above, glabrescent underneath with usually some pubescence at least along the nerves: lateral nerves about 16 on either side of the midrib with often a few intermediate ones, slender but conspicuous, tertiaries finely reticulate in square or rectangular pattern; base very gradually cuneate; petiole 7-12 in. long, slightly channelled, usually pubescent; leaf-buds lanceolate, ferruginous-pubescent outside; old leaves yellow. *Flowers* axillary, rarely terminal, solitary, 12-18 in. long, pale-yellow to deep dun-yellow, very fragrant; buds ovoid; bract spatheoid, broadly ovate, about 1 in. long, as broad as, or broader than long, often silky outside. *Sepals* and *petals* 15-21, oblong or oblanceolate, gradually narrower towards the centre. *Fruit-spike* 3-6 in. long; ripe carpels 6-8 in. long, ovoid or ellipsoid, generally sessile, white-speckled, woody when dry.

Occurs sporadically in all DISTRICTS generally along the foot of the HILLS, but not at all common. Much cultivated for its flower.

Heartwood light olive-brown, very durable, seasons and polishes well, useful for cabinet work and building.

Fls. 4-6. Fr. 4-6. of the following year.

5. *Michelia Kisopa* DC. Vern. *Chohsi*, Nep.

A tall deciduous tree with plain grey bark and thin lenticelled branchlets. *Leaves* 9-5-6-5 by 1-5-3 in., ovate, elliptic, oblong-or elliptic-lanceolate, acute or shortly acuminate, abruptly cuneate, rarely rounded at the base, thinly coriaceous, glabrous on both surfaces, shining above, dull underneath, turning yellow before falling; lateral nerves 10-15 on either half, only slightly arched towards the outer extremities; reticulations very close and fine; petiole 8-15 in. long, rusty-puberulous when young; stipules 6 in. long, oblong, grey or rusty-pubescent outside. *Flowers* pale-yellow, axillary, shortly-stalked, 1-1½ in. diam., delightfully scented; buds 5 in. long; bracts 2, fleshy, grey-pubescent outside. *Sepals* and *petals* 12-15, obovate or oblanceolate, glabrous. *Stamens* shorter than the gynæcium. *Carpels* silky-hairy; styles recurved. *Fruit-spikes* 2-4 in. long; ripe carpels sessile, 3-4 in. diam., compressed, closely lenticelled; seeds 3-4.

Cultivated at Shillong.

Wood yellowish, suitable for use as door-frames and planking.

Fls. 7-9. Fr. 11-1.

6. *Michelia punduana*, Hk. f. & Th. Vern. *Dieng-rtiang-khlaw*, Synt.; *Deng-soh-niar*, *Dieng-rai*, Khasi.

A middle-sized tree; young parts densely red-silky. *Bark* grey, 5-7 in. thick, thinly corky and with horizontal wrinkles outside, inside aromatic, granular yet fibrous, hard, brown,

mottled with coarse streaks of darker brown, soon turning uniformly deep-brown after exposure. *Leaves* 3-6 by 1.5-2 in. oblong, elliptic, obovate or oblanceolate, abruptly acuminate, base acute or cuneate; coriaceous, glabrous on both surfaces, shining above, pale or sub-glaucous beneath; lateral nerves 8-12 on either half, obscure, reticulations open, visible on both surfaces; petiole .5-.75 in. long, rather stout; stipules about as long as the petiole, narrowly oblong. *Flowers* axillary, solitary, rarely in pairs, 1.3-1.5 in. across, on short, thick, rufous stalks; buds .5-.7 in. long, ovoid, sharply pointed densely rufous-velvety. *Sepals* and *petals* 9-12, white, of the outer whorls obovate-cuneate, of the inner narrowly oblanceolate, pointed, not much scented. *Stamens* about 80, slightly shorter than the gynoecium. *Carpels* about 50, beaked. *Fruit-spike* 2-4 in. long; ripe carpels .3-.4 in. diam., obovate or sub-globular, compressed, lenticellate, not beaked; seed solitary, aromatic with a scarlet arillus and black testa.

Appears to be confined to the KHASI HILLS, 4-5,000 ft., e. g., Cherapunji, Jowai, Jorain, etc.

Wood of a dull grey colour, compact, even grained, little liable to warp or split, weighing about 37 lbs. per c. ft., capable of being used for planking and furniture. Medullary rays close and uniform.

Fls. 10-11.

7. *Michelia oblonga*, Wall. Vern. *Phul-sopa*, *Bor-sopa*, *Kothal-sopa*, Ass.; *Dieng-la-roi*, Khasi; *Chambi-sersang*, *Bewachhamphé*, Garo; *Serio asiny*, Miri & Abor.

A lofty tree up to 150 ft. in height, generally buttressed at the base. *Bark* grey, rough and warty outside, more or less plain and with horizontal wrinkles on young trees, green below the corky layer, inside light-brown with close and reticulating streaks of darker brown, turning dirty brown on exposure (when the streaks become invisible), .7-1.5 in. thick, aromatic. *Leaves* 3.5-7 by 1.5-2.7 in., oblanceolate, sometimes ovate, suddenly shortly acuminate, thinly coriaceous, shining above, pale and often glaucous beneath, turning yellow before falling; lateral nerves 10-12 on either half, sometimes with shorter intermediate ones; tertiaries laxly reticulate, the reticulations being conspicuous on both surfaces on dry leaves; base acute; petiole .6-1 in. long, rather slender, channelled, slightly swollen at the base; stipules narrow-oblong, as long as the petiole. *Flowers* white, scarcely scented, axillary, solitary, on short annulate peduncles; buds .8-1 in. long, elongate-ovoid. *Sepals* and *petals* 12 in all, white, fading to pale-yellow, 1-1.5 in. long, oblanceolate or spatulate. *Stamens* about 50; filaments .1 in., anthers .6-.8 in long, turning brown after opening. *Carpels* about 40, glabrous, generally 4-ovuled. *Fruit-spike* 6-7 in. long; ripe carpels lax, sessile, obovoid, terete, speckled, upto .8 in. in length.

Fairly common in evergreen forests excepting NOWGONG, KAMRUP and GOALPARA; also in the GARO and KHASI HILLS.

Timber greyish-white with greenish grey, very fine-grained with close uniform medullary rays : weight about 40 lbs. per c. ft. Much prized for Planking and cabinet work, as it does not warp or split.

Fls. 2-3. Fr. 8-10.

8. *Michelia Mannii*, King. Vern. *Kothalua-sopa*, Ass. (Lakh.)

A middle-sized evergreen tree, wholly glabrous ; branches lenticelled. *Leaves* 4-7 by 2-4 in., oblanceolate to obovate with a subacute apex, firmly coriaceous, glabrous, shining above somewhat dull underneath ; lateral nerves rarely more than 10 on either half, tertiary conspicuously but broadly reticulate ; base acute ; petiole 8-12 in. long finely channelled, swollen at the base ; stipules narrowly oblong, smooth. *Flowers* white, axillary, solitary, 2-5-3 in., across, on short peduncles ; buds 1-2 in. long, oblong, smooth. *Sepals* 3, 6-8 by 1-1-5 in., linear. *Petals* 6, oblanceolate, in two series those of the inner series slightly smaller. *Stamens* as long as, or overtopping the gynoecium. *Carpels* sessile, smooth ; style short. *Ripe-fruit* 5-7 in. long, with a fleshy rachis ; ripe carpels up to an inch in length, oblong or obovoid, sparsely lenticellate, 2-seeded.

Makum Forest Range, LAKSHIMPUR DISTRICT, not very common.

Nothing is known about the quality of the timber, but it is likely to be as useful as most of its other co-genera.

Fls. 11-12. Fr. 4-5.

9. *Michelia manipurensis*, Watt. Mss. ex. Brandis Ind. Trees Vern. *Dieng-rai* Khasi ; *Sopa*, Ass.

An imperfectly known middle-sized evergreen tree, young parts rufous-silky. *Bark* grey-corky outside with vertical lines of larger lenticels, soft inside white mottled with brown specks, turning uniformly brown on exposure 3-4 in. thick, not bitter. *Leaves* 3-7 by 1-5-2-3 in. oblong or oblong lanceolate, acuminate, cuneate at the base, coriaceous, glabrous, not particularly shining above, dull or sub-glaucous beneath, lateral nerves 10-12 on either half, conspicuous underneath, reticulations fairly close, equally distinct on both surfaces ; petiole 7-5-1-2 in. long, margined. *Flowers* axillary, solitary, shortly stalked ; buds about 1 in. long, lanceolate in outline, apiculate, slightly falcate, densely silky-rufous outside. *Fruiting-spike* 2-5-4 in. long ; ripe carpels few generally at the extremity of the spike, with many barren carpels below, and sometimes with a few between them, 3-5-4 in. diam., sub-globose compressed, beaked, lenticellate.

SIBSAGAR—Baruasali ; LAKHIMPUR ; KHASI HILLS upto 6000 ft. e, g Lum Suar.

Timber not seen,

Fls. oct. Fr. remains fully a year on the tree.

10. *Michelia montana*, Bl. Vern. *Pan sopa*, Ass. (Sibs.)

A fairly large evergreen tree. *Bark* grey outside, smooth but with close horizontal wrinkles, inside dark-brown, fibrous and much mottled, aromatic. *Leaves* 3-5-7-5 by 1-3-3 in., ovate elliptic or obovate, somewhat suddenly acute, coriaceous, glabrous

and shining on both surfaces; main lateral nerves 9-11 on either half, slender, often with a few intermediate ones between. Tertiary veins closely reticulate and distinct on both surfaces (at least on dry leaves); base cuneate; petiole 7-1 in. long, slender, finely channelled, slightly swollen at the base. Flowers white, axillary, solitary or sometimes 2 from a short peduncle; pedicels slender, 8-1 in. long; buds cylindrical. Sepals and petals about 8, 8-1 in. long, oblanceolate or linear. Stamens overtopping the velvety gynoecium of 2-4 carpels. Ripe carpels 1-3, 2-2.5 by 1.2-1.5 in., obovoid, sessile or shortly stalked, woody, speckled with large white lenticels; seeds 3-4, 5 by 3 in., reddish-brown, faceted, suspended by an elastic cord.

Makum Range, LAKHIMPUR; CACHAR-Owden! Cultivated at Jorhat. Apparently not very common. Mann's Longai specimens are probably not this species.

The timber is probably as good in quality as of most other species of the genus, although not much known owing to the scarcity of the tree.

Fls. 7-9. Fr. 8-9 of the following year.

1. *Michelia excelsa*, Bl. and *M. manipurensis*, Walt. have been reduced to *M. doltsopa*, Buch-Ham. by Dandy (Journal of Botany Vol. LXV (1927) p. 277-279).

It is possible that an allied species which is not covered by this, exists, in N. E. Frontier District and Manipur which further field observations may bring to light.

2. *Michelia Kingii*, Dandy.

Dandy maintains (Journal of Botany, Novr. 1928) that the Indian plant included under this name is a new species, and describes it under the above name. He has drawn up the following key for separating it from *M. montana* proper:—

Tepals sub-similar in texture, all rather fleshy;
penultimate bract inserted well below the
middle of the peduncle; valves of mature
fruiting carpels not very convex outside. . . . *M. Kingii*

Tepals very dissimilar in texture, those of the
outer whorl membranous, those of the inner
two whorls fleshy; penultimate bract inserted
usually about half way up the peduncle;
valves of mature fruiting carpels convex outside. *M. montana*.

***Michelia Wardii*, Dandy.** A large tree. Leaves about 6.2 by 1.5 in. oblanceolate, narrowly oblong to elliptic oblong acuminate or sometimes acute, glabrous above, undersurface glaucescent and glabrous to thinly adpressed pubescent on the nerves, base decurrent into the petiole which is up to about 5 in. long; stipules adpressed grey tomentose or pubescent outside. Spatheoid bracts, grey, sericeo-tomentose, peduncles thick, 2-2.5 in. long. Perianth cream coloured, 1.75-2.5 in. long, segments 9-12, pubescent outside. Carpels numerous adpressed pubescent at least when young.

Allied to *M. excelsa*, Wall. and *M. manipurensis*, Watt., from which it differs by grey indumentum of the stipules, spatheoid bracts and peduncles grey, and the narrower leaves, and the absence of twany or rufous hairs which are conspicuous in the earlier species.

Chibaon-Delei valley.

6. ILLICIUM, Linn.

Illicium Griffithii, Hk. f. and Th.

A large aromatic evergreen shrub 10-15 ft. high, without stipules; branches somewhat angular, glabrous, shining. *Leaves* 2-4 by 8-17 in. ovate, elliptic or lanceolate, shortly acuminate, acute at the base, coriaceous, glabrous, pellucid-dotted, shining above, dull-brown beneath, margins slightly recurved; lateral nerves 6-7 on either half, very obscure; petiole 4-6 in. long, channelled. *Flowers* axillary or terminal, solitary, about 1 in. in diam.; pedicels 5-1 in. long, recurved. *Sepals* 4-6, orbicular, acute. *Petals* 12-20, orbicular, not pointed, fleshy. *Stamens* 20-24, erect; filaments very short; anthers broad, blunt. *Carpels* about 20, in a single whorl, 1-ovuled with recurved styles. *Fruit* of spreading compressed beaked follicles; ripe carpels 8-12; seeds about 2 in. diam., sub-rotund, slightly compressed, glossy-brown.

KHASI HILLS. 4,500-5,500 ft., chiefly in gorges and deep ravines at Chera-punji and its neighbourhood.

The fruit is aromatic and has carminative properties.

Fls. Rainy season. Fr. Oct.

7. SCHIZANDRA, Michaux.

Sinistrorsely climbing glabrous shrubs. *Leaves* exstipulate. *Flowers* axillary, 1-sexual and dioecious, white, yellow or red. *Sepals* and *petals* 9-12, imbricate, generally in 3 series. *Stamens* 5-15 or more, spirally arranged; filaments monadelphous and short, or connate into a fleshy tube; anthers free, or sessile and half-buried in the head of connate filaments, cells small, remote. *Carpels* many, densely imbricated; stigma sessile; ovules 2, pendulous. *Fruit* an elongated spike of 1-seeded, rarely 2-seeded carpels; seeds albuminous.

Filaments free above; anthers free:—

Pedicels slender, 1-2.5 in. long. ... 1. *S. elongata*.

Filaments in one globose mass; anthers sessile:—

Pedicels stout, 2-7 in. long:—

Branchlets verrucose, rather thick. ... 2. *S. Propinqua*.

Branchlets plain, thin. ... 3. *S. axillaris*.

1. *Schizandra elongata*, Hk. f. and Th. Vern. *Soh-mijarian*, Khasi.

A deciduous woody climber; branchlets thin, lenticelled, scaly at the base. *Leaves* 1.5-3.5 by 7-15 in., ovate or oblong-lanceolate, membranous, rather soft, glabrous above, minutely verrucose and sub-glaucous underneath, margins cartilaginous, with or without minute, distant, cartilaginous teeth; base acute or rounded, somewhat unequal; main lateral nerves 4-6 on either half, oblique, arched, reticulations open, faint; petiole 6-8 in. long, slender, channelled above. *Flowers* yellowish; 5-7 in. diam.; pedicels 1-2.5 in. long, slender. *Sepals* 3, orbicular, green outside, yellow within. *Petals* 6, ovate-orbicular, larger than the sepals. *Stamen*

spirally arranged; filaments monadelphous below, free and tubular above; anthers with a thick connective. *Carpels* 20-24, imbricated on a conical receptacle. *Fruit-spike* 2-3 in. long, rachis slender at the base, swollen at intervals above; ripe carpels sessile, globose, not beaked.

KHASHI HILLS, 5,-6,000 ft., c. g., Shillong Peak. Elephant Falls. etc.

Fls. 5-6. Fr. 8-9.

2. *Schizandra propinqua*, Hk. f. and Th.

A woody climber; stem dark-brown; branchlets succulent, brown, verrucose and lenticellate. *Leaves* 3-6 by 1-2 in., ovate-lanceolate, acuminate, somewhat fleshy and soft, glabrous, dark-green and shining above, pale and minutely gland-dotted underneath, margins with minute distant gland-teeth; base cuneate or more or less rounded, slightly unequal; lateral nerves 8-12 on either half, arched, not prominent, reticulations open, obscure; petiole 4-6 in. long, rather stout. *Flowers* 5-9 in. diam., yellowish, axillary, solitary, slightly scented; pedicels 4-7 in. long, stout, minutely bracteolate. *Sepals* and *petals* ovate or obovate, concave in bud. *Filaments* connate into a globose brick-red fleshy mass, about 3 in. diam., anthers 12-15 or more, embedded in the mass of filaments. *Fruit-spike* 4-6 in. long, with a fleshy cylindrical rachis; ripe carpels globose, shortly stalked, baccate, 2-seeded.

KHASHI HILLS, c. g., Laitkor Forest, 5,200 ft. Rather scarce.

Fls. 8-9. Fr. 10-11.

3. *Schizandra axillaris*, Hk. f. & Th.

A slender woody climber; old stems with thick corky reticulations, branches lenticellate, branchlets plain, angular. *Leaves* 2-5 by 1-1.3 in., narrowly oblong-lanceolate, long-acuminate, minutely gland-toothed at irregular intervals along the margins, tapering at the base, thinly coriaceous and somewhat succulent, glabrous, deep green above, pale beneath; lateral nerves 6-8 on either half, slender, reticulations very open, faint; petiole 4-6 in. long, narrowly margined. *Flowers* dull-scarlet, axillary, solitary, about 5 in. diam., sessile, or on short bracteolated pedicels. *Sepals* orbicular, rather fleshy, concave. *Petals* ovate. *Stamens* as in *S. Propinqua* but generally with fewer anthers. *Fruit-spike* 1-2 in. long; ripe carpels sub-sessile globose, 1-2-seeded.

KHASHI HILLS, 4,-5,000 ft.; ravines near Shillong, not at all common.

Fls. 7-9. Fr. 10-11.

***Schizandra spheanthra*, Rehd & Wils.** A large glabrous rambling shrub. *Leaves* 2-7 by 1-2 in., ovate or ovate-elliptic, acuminate distantly denticulate, base broadly cuneate, often unequal, membranous main lateral nerves 6-8 on either half; petioles 5-1 in. long. *Flowers* deep cherry red, about 7 in. across, pedicels slender axillary 1-1.7 in. long, outermost perianth segments much smaller than the inner ones. *Fruit* in short compact purple hanging spikes—*Kingdon Ward*.

Mishmi Hills--Delei Valley, Kingdon Ward. A Chinese plant.

8 KADSURA, Kæmp.

Kadsura Roxburghiana, Arn. Vern. *Mi-ja-ngew*, Khasi; *Kang-mari*, Manip.

A woody evergreen climbing shrub; branches generally with elongated lenticels. *Bark* on old stems grey-corky and deeply reticulately furrowed; pith large. *Leaves* 3-6 by 1·3-2·4 in. elliptic to ovate-lanceolate, acute or shortly acuminate, distantly, dentate-serrate on young plants, entire on mature ones, soft and rather fleshy when fresh, but membranous when dry, quite glabrous; main lateral nerves 10-12 on either half, often with shorter intermediate ones between, tertiaries obscure on fresh leaves but fairly distinct on the under surface of dry leaves, reticulations with large meshes; base subacute; petiole '6-8 in. long, slender, sharply margined; stipules 0. *Flowers* 1-sexual, whitish, axillary, solitary, about '5 in. across, on peduncles '3-5 in. long, with as many as a dozen ciliate bracteoles, the uppermost passing into the sepals, elongating as the fruit matures to about 1 in. *Sepals* and *petals* 12, the largest '25 in. long, orbicular. *Stamens* about 12; outer filaments free, inner connate. *Carpels* many, imbricated; stigma sessile; ovules 2. *Ripe fruit* 1-1·5 in. diam., globose; ripe carpels '3 in. long, oblong and faceted, red, juicy, more or less coalescing, shortly mucronate: seeds orbicular, compressed. The fruits sometimes run into galls which assume the shape and size of small plantains.

Jaiपुर Reserve in LAKHIMPUR; Diroi Reserve and Garampani, SIBSAGAR, Charduar Reserve (Belsiri), DARRANG; also KHASI HILLS. Not rare, neither abundant.

Figs. 9-10, Fr. 10-11.

Magnolia globosa, HK, f. & T. A small tree, branchlets deciduously silky pubescent with reddish brown hairs. *Leaves* 5-8 by 2·7-5 in. ovate or elliptic acute or obtuse, and mucronate, base rounded or subcordate, thin or subcoriaceous, glabrous above, except the puberulous midrib, glaucous and pubescent beneath on the nerves, main lateral nerves 8-10 on either side; petiole 1-1·75 in. rufous tomentose like the stipules which are about 1·5 in. long. *Flowers* white solitary, 4-5 in. across each covered by a spathoid caducous rufous tomentose bract; pedicels stout, leaf opposed up to 2·5 in. long. *Sepals* and *petals* 3 ovate, the latter smaller. *Ripe fruit* 1·5-2·7 in. long; oblong or ovoid cylindric; carpels with short recurved deciduous beaks.

Mishmi—Delei valley, 9000 ft. Kingdon Ward.

FAM. 4. ANONACEÆ.

Trees or shrubs, erect or climbing, sometimes aromatic. *Bark* usually with layers of anastomosing fibres inside, of branchlets marked by close reticulated longitudinal ridges. *Leaves* alternate, bifarious, simple, entire, extipulate. *Flowers* 3-numerous, usually 2-sexual. *Sepals* 3, usually valvate. *Petals* 6, in two series, or the inner obsolete. *Stamens* usually numerous, seated with the ovaries in the centre on a more or less conical or convex

torus; anthers 2-celled, sessile or subsessile, extrorse, connective enlarged or dilated. *Carpels* 1-celled, generally numerous and hairy. *Fruit* of numerous dry or succulent carpels on stalks which elongate as the fruit ripens, rarely united into a fleshy berry-like fruit. *Seeds* large with a hard shining testa and ruminated albumen.

I. TREES OR ERECT SHRUBS :—

A. Outer petals more or less flat, valvate :—

1. Petals uniform, flat :—

Ripe carpels baccate, with one basal seed.

Ripe carpels indehiscent with many ventral seeds and constrictions between them.

1. Polyalthia.

2. Unona (partly)

2. Petals subequal :—

a. Ripe carpels 6 or more usually with one sub-basal seed :—

Inner petals concave at the base, not clawed nor arching.

3. Popawia.

b. Ripe carpels many :—

i. Inner petals clawed and arching :—

Ripe carpels 1-seeded.

Ripe carpels with 2 or more seeds in two series.

4. Goniolhamus

5. Mitrephora.

ii. Inner petals saccate at the base (in the species here described), not clawed.

6. Alphonsea

c. Ripe carpels usually solitary, berries, many seeded. Petals saccate at the base.

7. Cyathocalyx.

3. Petals very dissimilar, valvate, outer small sepaloïd, inner much larger, flat. Ripe carpels generally 1-2 seeded.

8. Miliusa.

B. Outer petals, thin, imbricate, subequal. Ripe carpels 3 or more, 1-seeded in fruit.

9. Sageræa.

C. Outer petals triquetrous, valvate. Ripe carpels many, confluent into a many-seeded berry-like fruit.

10. Anona.

II. CLIMBING OR STRAGGLING SHRUBS :—

A. Petals imbricate in bud. Ripe carpels with 2 rows of seeds.

11. Uvaria.

B. Petals valvate in bud :—

1. Ripe carpels constricted between the single row of ventral seeds.

12. Unona (partly)

2. Ripe carpels not constricted :—

a. Petals nearly equal, concave and conniving at base. Flowers on hooked peduncles.

13. Ariabotrys.

b. Outer petals larger than the inner.

Outer petals thin and flat (in the species described here).
Carpels 1-seeded.

14. Oxymitra.

All petals thick and concave. Carpels with 2 or more seeds.

15. Melodorum.

1. POLYALTHIA, Bl.

Trees or shrubs, erect in all Assam species. *Flowers* axillary or leaf-opposed, bracteate, solitary or in few-flowered fascicles from axillary tubercles. *Sepals* 3, valvate or sub-imbricate. *Petals* 6 in two series, ovate or linear, flat or the inner slightly vaulted. *Torvs* convex. *Stamens* cuneate; anther-cells remote. *Carpels* indefinite; ovules 1-2, basal or sub-basal. *Ripe carpels* berry-like, 1-seeded.

- I. Flowers 1½ in. or more in diameter :—
 - A. Flowers fascicled or umbelled. Petals linear, yellowish green :—
 - Leaves narrow-lanceolate and taper-pointed with wavy edges. ... 1. *P. longifolia*.
 - Leaves ovate-oblong with even edges. ... 2. *P. simiarum*.
 - B. Flowers solitary or in pairs. Petals broadly lanceolate, white or pale-yellow. ... 3. *P. Jenkinsii*.
- II. Flowers under 1 in. in diameter :—
 - Sepals scarcely shorter than the petals. Petals greenish-white. ... 4. *P. cerasoides*.
 - Sepals much shorter than the petals. Petals red. ... 5. *P. suberosa*.

1. *Polyalthia longifolia*, Benth. and Hk. f. vern. *Unboi*, Ass.; *Debdurn*, Beng.

A handsome evergreen tree with a conical crown and dark greyish-brown bark. *Leaves* 3-5-9 by 8-15 in., narrowly lanceolate, taper-pointed, rather membranous, quite glabrous, shining above, subpellucid-punctate, with wavy edges, somewhat aromatic; main lateral nerves up to about 30 on either half, faint, very oblique, base cuneate; petiole 2-5 in. long. *Flowers* yellowish-green, 1-1½ in. long, in fascicles or very short umbels from axils of fallen leaves; pedicels slender, 1-2 in. long, with 1 or 2 minute bracts about the middle. *Sepals* about 2 in. long, ovate-triangular, densely-pubescent. *Petals* about 1 by 2 in., tapering from a slightly expanded base, puberulous. *Ripe carpels* numerous, black, 7-9 by 5-6 in., on glabrous stalks 3-5 in. long; seed smooth, shining.

Cultivated as an ornamental tree in almost all the towns of ASSAM. Wood whitish fairly even-grained but not strong. Suitable for packing-cases, barrels, etc.

Figs. 3-5. Fr. 7-9.

2. *Polyalthia simiarum*, Benth. & Hk. f. Vern. *Bor-koliori*, Ass. (Makum); *Boga-khamton*, Ass. (Darr.); *Deing-tar-sei*, *Deing-ja-roi*, Khasi; *Silem-phang*, *Senem-phang*, Kach.; *Mengchuri-arong*, *Phangput-arong*, Mik.; *Jethou*, Kuki; *Jathou*, Tipp.; *Mikir-asing*, Miri; *Khandou*, Meeh; *Bolang-banchibok*, *Jiri*, *Borslhi*, Garo.

A large tree up to 100ft. in height and 8 ft. in girth, practically evergreen, with a simple stem, thin horizontal branched and very thin branchlets. *Bark* light or dark-grey and smooth nearly outside except for horizontal wrinkles and very fine vertical fissures, blaze light-brown or white with often a shade of purple.

in thin lace-like concentric layers, about 1 in. thick. *Leaves* bifarious, 5-10 by 2-4½ in., oblong, obovate, elliptic or lanceolate, rather abruptly acuminate, thickly coriaceous, glabrous and shining above, sometimes more or less pubescent along the midrib and nerves beneath, pinkish-brown and drooping when young; lateral nerves 12-18 on either half, arcuate, conspicuous beneath, tertiaries transverse to the secondary nerves, parallel, very slender; base rounded, rarely suddenly cuneate; petiole about 2 in. long. *Flowers* yellowish green, 1-1½ in. long, in fascicles from axils of fallen leaves or from tubercles on the branches; pedicels as long as the flowers, slender, minutely pubescent with a bract about the middle. *Sepals* 1-1½ in. long, bluntly ovate, recurved, pubescent outside. *Petals* 1-1½ in. long, strap-shaped or linear-lanceolate, spreading, puberulous outside, equal or the inner somewhat longer. *Ripe carpels* about 40, 1.25-1.5 in. long, obovoid, glabrous, turning orange-red to blue-black in ripening, gradually narrowed to a stalk 1-2 in. long. *Seed* ovoid, grooved and transversely ribbed.

Fairly common throughout UPPER ASSAM but very common in the MIKIR HILLS and forests along the foot of the HIMALAYAS in DARRANG, e.g. Pabhoi, Nanduar, Balipara, etc.

Fresh-cut wood is white outside but yellowish towards the centre. Annual rings indistinct; medullary rays close and equidistant; pores of various sizes and of irregular shape. Weight about 35 lbs. per c. ft. The wood seems to be suitable for tea-boxes and such other purposes. The fibres of the bark are made into ropes.

Fls. 6-11. Fr. 5-8.

3. *Polyalthia Jenkinsii*, Benth. and Hk. f. Vern. *Koliori*, *Tita-hachi* (*sachi*), *Kola-khamtou*, Ass.; *Dieng-ther*, Khasi; *Thengpiopsu*, Mik.; *Khem-juti*, *Thaisin-jola*, Kach.; *Jong-mochal*, Jathu, Kuki; *Bol-jakru-ehhen*, Garo.; *Kalikath*, Nep.

A middle-sized evergreen tree with a simple stem often fluted at the base and thin but long horizontal branches; young shoots generally rusty pubescent. *Bark* black or very dark-brown and fairly smooth outside, yellowish or brown inside, 2-3 in. thick. *Leaves* 4-7 by 12-3 in., oblong-lanceolate, elliptic or ovate, acute or acuminate, membranous or chartaceous, dark-green, glabrous except the midrib above which is puberulous, shining above; lateral nerves 7 on either side, slender, arching, forming an intramarginal nerve away from the edge, tertiaries finely reticulating; base generally acute or subacute; petiole 2-3 in. long, puberulous. *Flowers* axillary, generally solitary, spreading, 2-3 in. diam., scented, white to pale-yellow; pedicels 6-8 in. long, expanding towards the apex, bracteate at the base. *Sepals* very small, suborbicular, puberulous. *Petals* sub-coriaceous, oblanceolate, narrowed at the base, faintly longitudinally nerved. *Ripe carpels* 30-50, 4-5 by 25-3 in., oblong, apiculate, verruculose, on slender stalks as long as the carpels. *Seeds* smooth.

Found in all the Districts specially of UPPER ASSAM. Fairly common in some parts of the SIBSAGAR DISTRICT including the MIKIR HILLS; also in the GARO, KHASI and N. CACHAR HILLS and the SURMA VALLEY.

The wood is used for house-posts and ridge poles. The Kacharis consider poles of this tree indispensable for carrying their dead bodies.

Fls. 8-10. Fr. 12-6.

4. *Polyalthia cerasoides*, Benth. & Hk. f.

A shrub about 10 ft. high with black or pale-grey lenticellate bark; young parts rusty-tomentose. *Leaves* 3-7 by 1-1.5 in., oblong-lanceolate, generally long-acuminate, membranous, glabrous above except the midrib which is puberulous, glabrescent beneath; main lateral nerves 8-10 on either side besides a few intermediate ones, very slender and arched, forming loops away from the edge, indistinct above; base more or less rounded; petiole .1 in. long, stout. *Flowers* axillary, greenish-white, .3-5 in. diam. *Sepals* membranous, ovate-lanceolate, hairy outside, glabrous inside, as long as or slightly shorter than the petals. *Petals* 2-3 in. long, coriaceous, puberulous, incurved. *Ripe carpels* about .4 in. long, ellipsoid or ovoid, on stalks .5-7 in. long.

Nizamghat, N. E. FRONTIER DISTRICT.

Fls. 10-12.

5. *Polyalthia suberosa*, Benth. & Hk. f. Vern. *Makhamsra-phang*, Kach.; *Habida-cha* (wild tea), Mik.

A large handsome shrub branched almost down to the base; branchlets rusty-pubescent; older ones lenticellate; stem dark-brown with reticulately furrowed cork. *Bark* reddish inside, about .1 in. thick. *Leaves* 2-5 by .8-1.6 in., oblong, obtuse, or sub-acute usually thin glabrous and shining above, sparsely pubescent or glabrescent beneath. *Flowers* .3-4 in. across, on slender extra-axillary peduncles .5-1 in. long, which are puberulous and with minute bracts at the base. *Sepals* much smaller than the petals, spreading, pubescent. *Petals* reddish-brown, ovate, silky outside, the outer shorter than the inner. *Ripe carpels* subglobose, .2 in. diam., on stalks .2-3 in. long; seed globose, smooth.

NOWGONG; KHASI HILLS.

Deserves to be planted in gardens on account of its ornamental appearance.

Fls. 4-5. Fr. 10-12.

2. UNONA, Linn.

Trees or shrubs, the latter erect or climbing. *Leaves* generally thin. *Flowers* axillary, leaf-opposed or terminal, often solitary. *Sepals* 3, valvate. *Petals* 6, valvate, in two series (the inner wanting in *U. longiflora*), long or elongated. *Stamens* cuneate; anthers extrorse. *Carpels* numerous; styles recurved, grooved. *Ripe carpels* generally elongate and constricted between the seeds. *Seeds* 1-8.

A tree. *Leaves* upto 5 in. in length; petals strap-shaped, thin.

Shrubs erect, sarmentose or climbing:—

Flowers red usually on very long axillary peduncles:—

Petals 3 (sometimes 2), 5-6 in. long, very narrow, fleshy with no constriction between claw and limb.

Leaves up to a foot in length.

... 1. *U. præcox*.

... 2. *U. longiflora*.

Flowers yellow or yellowish-green on long or short extra-axillary peduncles :—

Petals 5 in 2 series, more or less broad and narrowed above the claw :—

Generally sarmentose. Flowering peduncles 2-7 in. long. Leaves up to 9 in. in length. ... 3. *U. Desmos*

Erect shrub, often climbing. Flowering peduncles 1-2 in. long. Leaves up to 7 in. in length. ... 4. *U. discolor*

Climbing shrub. Flowering peduncles up to 1.5 in. in length. Leaves up to 5 in. in length. ... 5. *U. dumosa*.

1. *Unona præcox*, Hk. f. & Th. Vern. *Porteng-phang*, Kach.

A deciduous tree up to 90 ft. in height and 4 ft. in girth with a narrow conical crown; young shoots puberulous. Bark grey fairly smooth except for warts, shallow vertical fissures and faint horizontal wrinkles; inside light-brown, very fibrous and in thin lace-like plates. Leaves 2.5 by 1-1.8 in., elliptic ovate or lanceolate, finely acuminate, membranous, glabrescent, minutely punctate underneath; main lateral nerves 10-12 on either half, very slender, arcuate, tertiaries exceedingly fine and closely reticulate; base cuneate; petiole 2-3 in. long, slender, channelled. Flowers light-green, 2.5-3.5 in. long, from bases of current year's shoots, pendulous, sweet-scented; peduncles 1 in. long, slender, ebracteate. Sepals 4-7 in. long, linear-oblong, membranous, reflexed. Petals—outer 2.5 by .25, inner 3.2 by 3 in., linear, membranous, glabrous, pale-green. Stamens truncate. Carpels glabrous; styles oblong, pilose.

Banks of the Burisoli in the N. E. FRONTIER DISTRICT also Dhansiri Reserve in NOWGONG DIVISION, and other parts of the MIKIR HILLS,—not very common.

Wood light-grey; medullary rays fairly broad, not very close; annual rings marked by larger and more numerous pores.

Fls. 4-5.

2. *Unona longiflora*, Roxb. Vern. *Jor-lewa*. Ass.; *Dieng-phallam*, Khasi; *Dieng-sa-la-tyrkai*, Synt.; *Theseming*, Mikir; *Meruang-omak*, Garo.

Usually an erect glabrous shrub with a simple stem 10-12 ft. high and slender spreading branches; branchlets minutely verrucose when dry; leaf-buds silky. Leaves 5-12 by 1.7-4 in., narrowly oblong or oblong-lanceolate, acute or acuminate, chartaceous, green and more or less shining above, glaucous beneath; lateral nerves 12-16 on either half, tertiaries sub-parallel and more or less transverse to the secondary nerves, the spaces between them closely reticulate with very slender quaternary nerves; base rounded or subcuneate; petiole 3-5 in. long somewhat swollen, finely channelled, verrucose. Flowers red, horn-shaped in outline, pendulous; peduncles axillary, 1-4 in. long, elongating in fruit, bracteate and jointed near the base, expanded at the upper extremity. Sepals 3, very broadly triangular, acute, pubescent outside. Petals 2 or 3, 3-6 in. long, very gradually tapering from a broad base, red, fleshy, puberulous outside, inner wanting. Connectives of stamens produced but truncate. Carpels few in

flowers with long peduncles, but up to about 60 in short-peduncled-flowers. *Ripe carpels* 7-60 (varying inversely with the length of the peduncle), moniliform, on stalks '6-1 in. long which are channelled above; joints 1-4, '5-7 by '2-3 in. elongate-ellipsoid, verrucose.

In ravines of the MIKIR HILLS near Barpathar also Daiang Reserve, SIBSAGAR DIVISION; Kuli reserve KAMRUP; CACHAR; and KHASI HILLS upto 3500 ft.

Fls. 4-5. Fr. 10-12.

3. *Unona Desmos*, Dunal.

A straggling or climbing shrub; branchlets rufous-pubescent. *Leaves* 4-9 by 1.5-3.5 in., oblong-lanceolate, acute or acuminate thinly coriaceous, glabrous above, puberulous beneath; lateral nerves 12-14 on either half; base rounded; petiole '3-4 in. long. *Flowers* solitary, about 2 in. long, yellow, odorous, pendulous; peduncles extra-axillary, 2-7 in. long, slender, 2-bracteate. *Sepals* '3-4 in. long, ovate, acuminate, pubescent. *Petals* coriaceous, obovate to ovate-lanceolate, golden-pubescent, longitudinally 3-6 nerved, outer up to 2 by 1 in., inner shorter and narrower. *Ripe carpels* numerous, '5-7 in. long on stalks of the same length, glabrous, constricted between the 1-6 joints, glossy-green when young.

In evergreen forests between Makum and Luming.

4. *Unona discolor*, Vahl.

A spreading ever-green erect shrub, 6-8 ft. high, often also climbing, with rough grey bark; young branches slender, more or less pubescent. *Leaves* 2-farious, 3-7 by 1-2 in., oblong, oblong-lanceolate or oblanceolate, acuminate, rounded at the base membranous, glabrous above, pale and more or less pubescent beneath, (in var. *pubescens* densely so); lateral nerves 8-12 on either half, very oblique, slender, free at the outer extremity. *Flowers* leaf-opposed or extra-axillary, solitary, about 2 in. long on peduncles 1-1.5 in. long, with a small linear bracteole below the middle, slender in flower, thickening in fruit. *Sepals* '4-6 in. long, ovate-acuminate, spreading. *Petals* about 2 in. long, narrow-lanceolate coriaceous, glabrous or adpressedly silky. *Anthers* with a spreading top. *Ripe carpels* numerous, '75-1.5 in. long, 2-5-seeded, constricted between the ovoid joints, on stalks '2-2.5 in. long.

UPPER ASSAM, SYLHET and the KHASI HILLS; fairly common in ever-green forests.

Fls. 4-6. Fr. 9-12.

5. *Unona dumosa*, Roxb.

A large woody climber; young shoots softly rufous-tomentose. *Leaves* 2-5 by 1.3-2.5 in., ovate-oblong, obovate or lanceolate, subacute, membranous, glabrescent above, softly rufous-tomentose beneath; lateral nerves 8-12 on either half, straight or slight-

ly arched; base rounded or subcordate; petiole 2.5-4 in. long, rusty-tomentose. *Flowers* 2-3 in. long, solitary, yellowish-green, pendulous; peduncles leaf-opposed or terminal, 1-1.5 in. long, slender, tomentose, with a bract below the middle resembling a sepal. *Sepals* 4 in. long, ovate, tomentose, longitudinally nerved. *Petals* elliptic or spatulate, 3-7-nerved, velvety-pubescent; outer 2-3 by 7-1.5 in., inner somewhat smaller. *Ripe carpels* about 20, glabrous, 1-4-seeded, on stalks 5-7 in. long, much constricted between the ovoid or ellipsoidal seeds.

Dalang to Kalioni in the SIBSAGAR DISTRICT, possibly also in LAKHIMPUR between Jaipur and Margherita.

3. POPOWIA, Endl.

Evergreen erect shrubs or small trees. *Flowers* small, extra-axillary or leaf-opposed, often polygamous, never fully open. *Sepals* 3, ovate, valvate. *Petals* 6, in two series, valvate (inner imbricate in *P. Kurzii*), outer spreading, inner thick, concave, acute. *Anthier-cells* dorsal, remote. *Carpels* generally few, ovoid; ovules 1-2, ventral or basal, erect. *Ripe carpels* berry-like.

Leaves wholly glabrous, silvery underneath; tertiary nerves transverse to the secondary. Inner petals valvate. ...

1. *P. Hookeri*.

Leaves sparsely adpressed-pubescent on both surfaces, granulate above; petiole tomentose; midrib strigose; tertiary nerves transverse to the midrib. Inner petals imbricate ...

2. *P. Kurzii*.

1. **Popowia Hookeri**, King. Syn. *Polyalthia argentea*, Hk. f. & Th. Fl. Br. Ind. I. 67.

A wholly glabrous shrub; branches dark-brown or black. *Leaves* 4-7 by 1.2-2.5 in., oblong or oblanceolate, abruptly acuminate, thinly chartaceous, glabrous, dull-silvery beneath; lateral nerves 8-10 on either side, slender, arcuate, tertiaries transverse to the secondary nerves, more or less parallel; base acute; petiole 12-16 in. long, terete. *Flowers* very small, polygamous, solitary or in fascicles of 2-3 from extra-axillary tubercles. *Ripe carpels* 7-8 by .3 in., oblong, rugose, faintly transversely ribbed when dry, minutely apiculate, on stalks .2-.35 in. long.

Banks of the Dikhou, SIBSAGAR DISTRICT, towards the foot of the NAGA HILLS; also Balipara in DARRANG. Very possibly in similar localities elsewhere.

2. Popowia Kurzii, King.

A shrub 6-8 ft. high; young shoots tawny-pubescent. *Leaves* 4-9 by 1.5-3 in., obovate, oblanceolate or elliptic, thinly coriaceous, sparsely adpressed-pubescent on both surfaces, minutely granulate above, pale beneath; lateral nerves 8-12 on either side of the strigose midrib, arcuate, tertiaries faint, transverse to the midrib; petiole 2-2.5 in. long, stout, tomentose. *Flowers* extra-axillary, solitary or in pairs, sub-globose, subsessile. *Sepals* smaller than the petals and like them tomentose outside. *Petals* concave, outer valvate, slightly larger than the inner which are imbricate.

Fruit 8 in. by 3 in., rugose; seed with two longitudinal channels, otherwise smooth.

Only found hitherto at Garampani, DISTRICT SIBSAGAR.

Fls. 5-8. Fr. 10-12.

4. GONIOTHALAMUS, Bl.

Small trees or shrubs. *Leaves* generally large, oblong, coriaceous; lateral nerves short, anastomosing to form intramarginal loops. *Flowers* axillary, solitary or fascicled; peduncles with scaly distichous bracts at the base. *Sepals* 3, valvate. *Petals* 6, valvate, in two series; outer thick, flat; inner smaller, shortly clawed, cohering to form a volt over the stamens and carpels. *Stamens* many; anther-cells distant; connective prominent and produced beyond the anthers into variously shaped processes. *Carpels* many; ovules 1 or 2, in the latter case superposed, sub-basal. *Ripe-carpels* 1-seeded.

Leaves glabrous. Ripe carpels sub-sessile. ... 1. *G. sesquipetalis*.

Leaves brown-tomentose along nerves beneath.
Ripe carpels long-stalked. ... 2. *G. Simonsii*.

1. *Goniotalamus sesquipetalis*, Hk. f. & Th. Vern. *Soh-um-synrang*, *Skum-synsar*, Khasi; *Leikham*, Manipur; *Kham*, Lushai.

A sparingly branched undershrub 4-8 ft. high. *Leaves* 10-15 by 2-3.5 in., oblong, bluntly acuminate, narrowed at the base, coriaceous, glabrous, dark-green above, pale and minutely punctate beneath, margins revolute, midrib stout; lateral nerves 15-18 on either half, anastomosing to form large intramarginal loops; petiole about 5 in. long, stout, channelled. *Flowers* greenish-yellow, axillary or supra-axillary, solitary; buds triquetrous. *Sepals* 2-3 in. long, glabrous, green, shining inside. *Outer petals* 1 in. long, glabrous, or slightly pubescent outside, inner 7-8 in. long, pubescent. *Carpels* usually 5, sometimes more, with golden hairs; styles slightly recurved. *Ripe carpels* solitary or 2-4, 7 by 3 in., slightly tapering, shortly stalked, supported by the persistent calyx, red to cherry-coloured while ripening; seed large.

KHASI HILLS up to 4,000 ft. Also on the Bhuban Hill in CACHAR, 2,3000 ft., c. g., Mainadhar, Bhubandhar, etc.

The dry leaves are burnt as an incense in temples in Manipur.

Fls. 5-6. Fr. 11-12.

2. *Goniotalamus Simonsii*, Hk. f. & Th.

A large shrub or small tree; young parts brown-pubescent. *Leaves* 10-15 by 3-5 in., narrowly elliptic or obovate-oblong, caudate-acuminate, rounded or sub-acute at the base, thinly coriaceous, glabrous and glossy above, brown-tomentose chiefly along the midrib and nerves beneath, minutely punctate; lateral nerves 13-20 on either half, almost straight, anastomosing at their extremities to form a continuous wavy intramarginal nerve; reticulations strong but rather open; petiole 4-6 in. long, channelled, tomentose. *Flowers* axillary, solitary, 1-1.5 in. long,

peduncles 2-3 in. long, supported by a pair of bracts. *Sepals* 5 in. long, ovate or triangular, persistent. *Outer petals* 1.5-2 in. long, cream-coloured, oblong-lanceolate, pubescent; inner 5 in. long, forming a triquetrous cone, pubescent; style cylindrical. *Ripe carpels* 5 in. long, oblong, mucronate; torus elongated.

KHASI HILLS, 2,3,000 ft., chiefly along shady streams, e. g., Umran, Nongpoh, etc.

Fls. 5-6. Fr. 8-9.

5. MITREPHORA, Bl.

Mitrephora tomentosa, Hk. f. & Th. Vern. Kolti, Koliori, Ass.; *Jeithuh-ang-thing*, Kuki. *Thingpi-ikso-arong*, Golithi-arong, Mik.; *Sinam-jola*, Kach.

Usually a small evergreen tree, but individual trees have been seen up to 70 ft. in height and 5 ft. in girth. *Bark* smoothish excepting for very shallow and distant vertical fissures, dark-brown or very nearly black outside, generally with large white blotches; blaze very light dun-brown with distant broad strands of white and softer granular tissues, otherwise finely fibrous and in thin concentric layers. *Leaves* 3-7 by 1-3 in., varying in shape from ovate to narrow-lanceolate even on the same twig, acute or acuminate, subcoriaceous, dark-green, glabrous and shining above (except the pubescent midrib); undersurface velvety rusty-tomentose on young trees, glabrescent and pubescent along the nerves on older individuals; lateral nerves 10-15 on either half, slender, very oblique but only slightly arched, tertiaries invisible; base rounded; petiole 2-3 in. long, stout, tomentose. *Flowers* 2-3 in. across, in short leaf-opposed cymes, each supported by a large broad bract. *Sepals* 3, 2-3 in. long and as broad, acute, densely rusty-tomentose. *Outer petals* 1-1.5 by .7 in., yellow with faint purple veins outside, inner 5-7 by .5 in. clawed, closely purple-veined and velvety outside, white-hairy and ribbed inside, cohering by margins to form a vault over the anthers and stigmas. *Ripe carpels* 1 in. long, sub-globose, densely rusty-tomentose; seeds 2, plano-convex.

GARO HILLS, NOWGONG, N. CACHAR HILLS, KAMRUP, etc.

Wood even-grained, compact, dun-white, in regular thin concentric bands; medullary rays very fine, regular, about 125 to the inch; weight about 50 lbs. per c. ft. It is liable to split, but is used for posts and such other purposes in NOWGONG.

Fls. 5-5. Fr. 8-10.

6. ALPHONSEA, Hk. f. & Th.

Tall evergreen trees with tough fibrous bark. *Leaves* coriaceous, glabrous and shining above. *Flowers* generally in leaf-opposed fascicles; buds conical; pedicels bracteolate. *Sepals* 3, small, valvate. *Petals* 6, in 2 series, valvate, much larger than the sepals, of the inner whorl usually slightly smaller. *Stamens* indefinite; anther-cells dorsal; connective apiculate. *Carpels*

1-12; ovules 4-10 in 2 series. *Ripe carpels* 4-6, sessile or stalked, ovoid or oblong-ovoid.

Leaves 6-10 in. long, narrow-oblong. Sepals free.

Carpels long-stalked.

Leaves 3-6 in. long, ovate-oblong. Sepals connate.

Carpels very shortly stalked.

1. *A. ventricosa*.

2. *A. lutea*.

1. **Alphonsea ventricosa**, Hk. f. & Th. Vern. *Noga-kola*, Ass., *Norlok-arung*, *Jhingpi-arung-otwang*, Mik. (near Bar-pathar); *Thaisen-phang*, *Rulang-buphang*, Kach.; *Thet-wook-ek*, *Jong-mot*, Kuki; *Pakna-kala*, Cach.

A tall tree with a short conical crown, attaining 100 ft. in height and 7 ft. in girth; branches at first softly tomentose but become speedily glabrous and blackish. *Leaves* 6-10 by 1.5-2.8 in., oblong to oblong-elliptic, shortly acuminate; cuneate or rounded at the base, coriaceous, glabrous except for a little pubescence on the midrib beneath when young, shining above, turning yellow before falling; lateral nerves slender, irregular. 12-18 on either half, reticulations fine and open; petiole 1-2.5 in. long, stout, pubescent. *Flowers* greenish-white, 3-4 in. long, in short leaf-opposed extra-axillary racemes; pedicels 4-5 in. long, rusty-tomentose, with a bracteole at the base and another about the middle. *Sepals* very small, broadly ovate or deltoid, acute, tomentose outside. *Petals* 4-5 in. long, sub-equal, oblong, acute, sub-cordate and more or less saccate at the base, pubescent on both surfaces. *Stamens* broad, pointed. *Carpels* oblong, tapering to the apex, densely pubescent; ovules many. *Ripe-carpels* 1.5-2.5 by 1.2-1.8 in. diam., ovoid, minutely pubescent, yellowish when ripe, up to 4-5 from a single flower; stalk 4-5 in. long. *Seeds* compressed, in two rows, immersed in an aromatic yellowish pulp; testa horny, brown.

Along the foot of the NAGA HILLS in LAKHIMPUR and SIBSAGAR; CACHAR including the NORTH CACHAR HILLS; Singa Reserve in SYLHET; NOWGONG; Khaling-duar in DARRANG; GOALPARA—Guma res.; and KHASI HILLS—Raikhwān; probably all over the province.

Wood greenish brown, even-grained. Medullary rays of varying thickness, rather broader than in most other Anonaceous trees, tangential bars very close; pores large, often sub-divided. It is very elastic and is used for posts, poles, etc. Weight about 40 lbs. per c. ft. The aromatic pulp of the ripe fruit is eaten.

Fls. 3-4. Fr. 7-9.

2. **Alphonsea lutea**, Hk. f. & Th. Vern. *Jong-mot-kung*, Tipp. The Vernacular names of *A. ventricosa* are also loosely applied to this species.

Apparently a somewhat smaller tree than the foregoing species; young parts minutely rufous-tomentose. *Leaves* 2.5-6 by 1.2-2.3 in., ovate-oblong to elliptic, obtusely acuminate, sub-cuneate or rounded at the base, coriaceous, glabrous and shining above, sparsely strigose beneath; lateral nerves 8-10 on either half, faint and irregular. *Racemes* very short, leaf-opposed, subsessile, each with 2 or 3 flowers and many small bracts. *Flowers* 6-7 in. diam.; pedicels tomentose, with only one bracteole rather

above the middle. *Sepals* connate into a 3-cornered shallow cup, tomentose outside, glabrous inside. *Stamens* short, broad, flat in three rows. *Carpels* oblong, compressed, strigose; style very short glabrous. *Ripe carpels* 2-4, open solitary, 1.3-1.5 by .8-1.2 in., broadly ovoid, pointed, puberulous; stalk .2-4 in. long, very stout. *Seeds* 3-6, in two rows, oval-oblong, pointed.

Occurs along the south-eastern boundary of the PROVINCE chiefly in CACHAR and SYLHET, and is very liable to be mistaken for young individuals of the other species.

Economic uses and flowering and fruiting time are Probably the same as of *A. ventricosa*.

7. CYATHOCALYX, Champion.

Cyathocalyx martabanicus, Hk. f. & Th. Vern. *Bolong*, Garo; *Hrieroth*, Lushai.

A tall and graceful evergreen tree with a narrow crown attaining about 140 ft. in height and 6 ft. in girth. *Bark* .3-5 in. thick, grey and fairly plain but with a few horizontal wrinkles outside, dun-brown and faintly mottled inside, innermost layers in fibrous plates. *Leaves* sub-bifarious, 4-9 by 1.2-3 in. elliptic or elliptic-oblong, bluntly acuminate, cuneate or sometimes rounded at the base, coriaceous, glabrous, dark-green and shining above, somewhat pale beneath, turning yellow before falling; lateral nerves 8-12 on either half, very oblique, arching, slightly impressed above; reticulations very fine but distinct; petiole .3-5 in. long, margined. *Flowers* extra-axillary, sometimes opposite the axils, usually solitary, .8-1.5 in. long, densely buff-pubescent throughout, pedicels .3-5 in. long. *Calyx* as long as the pedicel, deeply divided; lobes oblong-lanceolate, reflexed. *Petals* in two whorls of three each, .7-1.2 in. long, oblong-lanceolate, spreading, somewhat fleshy, of the inner whorl slightly smaller. *Stamens* numerous truncate; anthers extrorse. *Mature carpel* solitary, 2.5-3 by 2.2-5 in., oblong, transversely depressed between the seeds, greenish-white, turning to cherry-colour when fully ripe. *Seeds* 6-10, transversely set in two rows, 1-1.2 by .7-9 in., oblong, flat, with a blunt ridge right round, brown shining; albumen mottled.

LUSHAI, NORTH CACHAR and the GARO HILLS, up to 5,000 ft. Rather rare.

The timber, though soft, appears to be very elastic. The sweetish-aromatic pulp of the ripe fruit is eaten.

Fls. 4-5. Fr. 10-11.

8. MILIUSA, Lesch.

Trees or shrubs. *Flowers* usually 2-sexual, rarely polygamous, green or red, axillary or extra-axillary, solitary fascicled or cymose. *Sepals* 3, small, valvate. *Petals* 6 in 2 series, valvate outer small like the sepals, inner larger but thinner, at first cohering by their margins, ultimately free. *Stamens* definite or indefinite; anthers extrorse; connective slightly apiculate. *Carpels*

indefinite; style usually very short. *Ripe carpels* globose, 1-2- or many-seeded.

Leaves velvety-tomentose on both surfaces, apiculate:—

Flowers 2-sexual. *Ripe carpels* puberulous, 2-seeded. ... 1. *M. velutina*.

Leaves glabrous and shining above, acuminate.

Ripe carpels, 1-seeded:—

Flowers 2-sexual. Leaves up to 7 in. in length, sub-

coriaceous.

Flowers polygamous. Leaves up to 5 in. in length. ... 2. *M. macrocarpa*.

membranous.

... 3. *M. Roxburghiana*.

1. *Miliusa velutina*, Hk. f. and Th. Vern. *Bor-Samphol*, Garo.

Rather a small-sized deciduous tree usually not exceeding 40 ft. in height; young branches and all other parts grey-tomentose. *Bark* dark-greyish-brown, rough, inside dun-brown, soft, 7-1 in. thick, fibrous. *Leaves* very variable in size and shape, 4-10 by 2.5-6 in., ovate-elliptic oblong or obovate, acute or shortly acuminate, more or less cordate at the base, sub-coriaceous, aromatic, thinly velvety-tomentose above, more densely beneath, turning yellow before falling; lateral nerves 12-16 on either half, slender, slightly arched; petiole 1-2 in. long. *Flowers* pale-yellow, about 4 in. diam., on 2-4 in. long slender ebracteolate pedicels, which arise singly or 2-3 together from short leaf-opposed peduncles. *Sepals and outer petals* similar, 1-in. long ovate, valvate in bud; inner petals 2-3 in. long, broadly ovate, dark-brown, densely tomentose outside, glabrous inside. *Stamens* short; filaments stout shortly apiculate; anthers distinct and distant. *Carpels* 2-ovuled; stigma subsessile. *Ripe carpels* .5-.75 in. in diam., ovoid or oblong, bluish-purple, on stalks .25-.35 in. long. *Seeds* 2 on a parietal placenta.

Foot of the GARO HILLS in Sal-bearing tracts e. g. near Fulbari; also on the Tokrabhandha and Chandordinga Hills of the North bank of the Brahmaputra in GOALPARA. Rare except in the above localities.

Wood weighs about 40 lbs per c. ft. and is moderately hard and durable, but being liable to warp is seldom used as timber.

Fls. 2-5, Fr. 8-10.

2. *Miliusa macrocarpa*, Hk. f. and Th.

A small tree; branchlets thin dark-brown, lenticellate when old. *Leaves* 2-7 by 1-2.4 in., bifarious, oblong, oblong-lanceolate or oblanceolate, caudate-acuminate, more or less acute at the base, membranous or chartaceous, dull and glabrous above except the midrib which is puberulous or muricate, pale but perfectly glabrous and shining underneath; main lateral nerves about 8 on either half, arcuate, slender but conspicuous, anastomosing to form a looped intramarginal nerve; petiole 1.2-2 in. long, stout, channelled. *Flowers* .7 in. across, extra-axillary or leaf-opposed, solitary or in few-flowered cymes on pedicels 1.25-2 in. long, which expand towards the upper extremity; buds globose or ovoid. *Sepals and outer petals* alike, ovate, acuminate, reflexed, glabrous and granulate outside, dull rusty-pubescent within. *Inner petals* obovate, .5-.6 in. long, erect, reddish-brown with red veins, glabrous except for a few fugacious hairs near the margins

and extremities on the inner surface. *Stamens* numerous intermixed with hairs; anthers linear. *Carpels* numerous, pubescent, stalked, 1-2-ovuled. *Ripe carpels* '6-'8 by '3-'4 in., oblong or obovoid, terete, generally 1-seeded; pericarp pulpy.

KHASI HILLS e.g., Wah Mawkhap, and similar other localities 3-5,000 ft. Fls. 5-5.

3. *Miliusa Roxburghiana*, Hk. f. and Th. Vern. *Bon-ponial*, (Makum); *Chhag-loti*, *Chhag-ladoi*, Ass. (N. Lakh); *Jora-bhanora*, Ass. (Darrang), *Dieng-khong*, Khasi, *Dieng-pwat*, Synt. *Tase-mayang-changne*, Dall.

A small deciduous tree scarcely more than 20 ft. in height with spreading branches and pubescent young shoots. *Bark* grey, fairly smooth but often with vertical rows of lenticels, inside dark-brown, turning deeper brown after exposure. *Leaves* 2-farious, somewhat aromatic 2-5 by '8-2 in., elliptic, oblong or lanceolate, acuminate, thinly coriaceous, upper surface glabrous except the puberulous midrib, lower at first pubescent, glabrescent with age; main lateral nerves about 10 on either side of midrib, arched and looped to form an intramarginal nerve away from the edge, tertiary veins inconspicuous; base more or less rounded; petiole about '1 in. long, pubescent. *Flowers* dioecious or polygamous about '5 in. long, axillary, solitary or 2-3 together on pedicels '5-1'5 in. long. *Sepals* and *outer petals* alike, small, lanceolate, reflexed, tomentose outside; *inner petals* red, '5-'6 in. long, ovate, subacute, more or less saccate at the base. *Ripe carpels* oblong or subglobose, '3-'35 in. long, glabrous, verrucose, on slender stalks '4-'8 in. long, generally 1-seeded.

Occurs in most DISTRICTS ascending to 4000 ft. in KHASI HILLS.

Wood greyish-white, hard; tangential bars close, numerous, wavy; medullary rays of various thickness, very numerous; pores very scanty; weight about 50 lbs. per c. ft. The wood is fit to be used for agricultural implements and such other purposes. The bruised leaves are used by the Dailas as smelling salt when they get headache.

Figs. 3-4. Fr. 11-12.

9. SAGERÆA, Dalz.

Sageræa laurina, Dalz. Syn. *Bocagea Dalzellii*, Hk. f. and Th.

A middle-sized tree up to 60 ft. in height and over 3 ft. in girth with a conical crown and thin glabrous branchlets. *Bark* grey and fairly plain outside with very faint vertical fissures '25-'5 in. apart, inside dull-white, consisting of alternate broad bands of fibrous tissue and similar bands of granular tissue. *Leaves* bifarious, 3-5 by 1-1'4 in., elliptic or oblanceolate, often somewhat unequal-sided, bluntly caudate-acuminate, abruptly cuneate at the base, chartaceous, glabrous and shining above, with minute translucent dots, and resinous mango-like smell when bruised, turning yellow before falling, midrib prominent beneath, puberulous; lateral nerves about 10-12 on either half, faint and irregular; petiole '2-'25 in. long flattened above, sub-verrucose beneath. *Flowers* dull-yellow, sweet-scented, '25-'3 in., in diam.,

from axils of previous year's leaves, solitary or in fascicles of 2-10, on sessile or stalked tubercles; pedicel 1.5-5 in. long with scaly bracteoles at the base. *Sepals* about 1.5 in. long, ovate, concave. *Petals* of both whorls similar in every respect. 5 by 1.6 in., thin in texture, more or less spreading. *Anthers* indefinite, dorsal. *Carpels* about 12; ovules about 12 in two rows; style short, lateral. *Ripe carpels* 4-10, shortly stalked, about 1 in. long, 1-seeded.

Only found so far on the Sanitarium Hill near Tura, GARO HILLS.

Wood of a slaty-grey colour even-grained, hard, weighing about 47 lb. per c. ft; medullary rays moderately broad, very regular; appears to be suitable for cabinet work.

Fls. & Fr. 2-4.

10. ANONA, Linn.

Shrubs or small trees. *Leaves* pellucid-punctate. *Flowers* terminal or leaf-opposed solitary or in fascicles of 2-3, drooping, yellowish-green. *Sepals* 3, small, valvate. *Petals* 3 or 6; of the outer whorl fleshy and 3-quetrous above with a thinner concave base; of the inner whorl, if present, very small, strap-shaped. *Carpels* partly free in flower, afterwards confluent into a large syncarpous fleshy fruit, 1-ovuled, 1-seeded. *Seed* with fleshy albumen.

Leaves 1.5-5 in. long, dark-green. Fruit greenish-white, deeply areolate and tubercled.

Leaves 5-8 in. long, light-green. Fruit reddish-brown, faintly areolate, not tubercled.

1. *A. squamosa*.

2. *A. reticulata*.

1. *Anona squamosa*, Linn. Vern. *Ata*, Beng.; *Ata-Kothal*, Ass.; *Sitaphal*, Hind. The Custard Apple.

Small tree with a somewhat bushy habit; branches thin, glabrous. *Leaves* 1.5-5 by 1-2 in., oblong or oblong-lanceolate, obovate, obtuse or rounded at the extremity, acute at the base, membranous, glabrate, aromatic; lateral nerves about 8 on either half, slender, oblique; petiole 3-5 in. long. *Flowers* about 1 in. long, pubescent. *Fruit* 2-3 in. in diam., globose deeply white-areolate when ripe; pulp white, sweet, aromatic; seeds 4-5 in. long, oblong-lanceolate in outline, testa horny glossy-black.

Cultivated in LOWER ASSAM and SURMA VALLEY for the fruit.

The roots, bark, leaves and seeds have valuable medicinal properties.

Fls. 3-5. Fr. 8-11.

2. *Anona reticulata*, Linn. Vern. *Nona*, Beng. *Ramphal*, Hind.

A larger tree with longer branches and more open crown than the foregoing; branches thin dark-brown or black, glabrous; fibres reticulate. *Leaves* 5-8 by 1.5-2.5 in., lanceolate or oblong-lanceolate, acuminate, subcoriaceous glabrous, dark-green. *Flowers* 2-3 together, 1-1.3 in. long; inner whorl of petals usually present. *Fruit* 3-4 in. diam. ovoid in outline reddish-brown when

ripe, smooth, faintly areolate : pulp pale, not so sweet or tasty as of the other species : seeds similar.

Sometimes cultivated, but often runs wild in the same localities as the other species. The wood of neither species has any timber value.

Fls. 7-8, Fr. 11-5.

11. UVARIA, Linn.

Scandent or straggling shrubs usually stellately pubescent. *Flowers* 2-sexual, terminal or leaf-opposed, solitary or in fascicles of 2-4, or cymose, yellow, purple or brick-red. *Sepals* 3, valvate, often connate below. *Petals* 6, large, orbicular, oval or oblong in two rows, imbricate, often connate at the base. *Stamens* indefinite : connective concealing the anthers. *Torus* depressed, pubescent or tomentose. *Carpels* indefinite, linear-oblong ; style short ; ovules usually many in two series. *Ripe carpels* many, ovoid or oblong, stalked, dry or baccate, few or many-seeded.

1. Outer stamens sub-foliateous :—

A. Leaves variously hairy. Ripe carpels tomentose :—

Peduncles extra-axillary, 1 flowered.

Flowers brick-red, 2 in. in diam.

1. *U. Hamiltoni*.

B. Leaves glabrous or nearly so. Ripe carpels glabrous :

Peduncles leaf-opposed. Flowers pale yellow, 5 in. diam.

2. *U. bracteata*.

Peduncles extra-axillary or terminal.

Flowers purple, 1½ in. in diam.

3. *U. macrophylla*.

II. Stamens all cuneate :

Leaves glabrous. Peduncle leaf-opposed or

terminal. Flowers brick red, 2 in. in diam.

Ripe carpels glabrous.

4. *U. lurida*.

1. *Uvaria Hamiltoni*, Hk. f. & Th.

A large woody climber ; branchlets rusty-tomentose, often circinate. *Leaves* 4-8 by 1½-4 in., elliptic-oblong or obovate, acuminate, rounded or slightly cordate at the base, membranous, adpressed-pubescent, ultimately glabrescent above, softly stellate-pubescent beneath ; lateral nerves 14-20 on either half, prominent beneath ; petiole 15-2 in. long. *Flowers* about 2 in. in diam., extra-axillary, solitary or 2-3 together ; peduncles 75-18 in. long ; bract basal, suborbicular. *Sepals* broadly triangular, mucronate, membranous. *Petals* about 1 in. long, red, obovate, coriaceous, minutely tomentose, incurved. *Anthers* about 2 in. long, subsessile. *Carpels* compressed, pubescent. *Ripe carpels* red, about 1½ in. long, obovoid, tomentose ; stalks slender, 1-1½ in. long, tomentose.

Var. *Kurzii*, King which differs from the type by having leaves with semi-cordate broader base and fewer nerves, somewhat smaller and yellowish flowers and shorter pedicels, has been found in the Guma Reserve in GOALAPARA and probably occurs in similar localities in other DISTRICTS.

The type occurs in all DISTRICTS in the BRAHMAPUTRA VALLEY and possibly also the SURMA VALLEY.

Fls. 6-7, Fr. 9-12.

2. *Uvaria bracteata*, Roxb.

A large woody climber ; young branchlets rusty-tomentose otherwise dark-brown. *Leaves* 3.5-7 by 1.25-2.5 in. oblong, oblong-lanceolate or oblanceolate, acute or shortly acuminate, tapering towards the rounded or subcordate base, chartaceous, thinly pubescent when very young chiefly along the midrib and nerves, afterwards glabrescent ; lateral nerves about 11-13 on either side of the midrib, slender, oblique, slightly arched ; petiole 1.5-3 in. long, glabrescent, shining. *Peduncles* extra-axillary, very short, generally 2 flowered ; pedicels 3-7 in. long, rusty-tomentose ; bracts 2 or 3, rather unequal, leafy. *Flowers* pale-yellow, 6-7 in. in diam. *Sepals* about 1.5 in. long, suborbicular or broadly ovate, connate at the base, pubescent, recurved when the flower is fully open. *Petals* green at first, fading to pale-yellow, 3-4 in. long, broadly ovate, fleshy but with thin margins, concave, shining. *Anthers* sub-sessile, oblong. *Carpels* 10-18, linear, pubescent. *Ripe Carpels* about 2 by 1.3 in., oblong, rounded at both ends, yellow when ripe, glabrous ; seeds discoid.

SYLHET and GOALPARA, chiefly in shady ravines.

Fls. 5-6, Fr. 8-10.

3. *Uvaria macrophylla*, Roxb.

A stout woody climber ; young parts and petioles rusty-tomentose. *Leaves* 5-10 by 2.5-4 in., elliptic-oblong or ovate, abruptly acuminate, coriaceous, glabrous or glabrescent above except the tomentose midrib and main nerves, rusty stellate-tomentose below ; lateral nerves 11-18 on either half, very prominent ; base rounded or slightly cordate ; petiole 2-3 in. long. *Flowers* purple, 1.5 in. diam. on few-flowered extra-axillary or terminal bracteate peduncles. *Sepals* connate in to a 3-toothed cup about 3 in. in diam. *Petals* 5-6 in. long, purple fleshy, tomentose outside, pubescent inside. *Anthers* sessile. *Ripe carpels* 7-1.5 in. long, oblong, glabrous, on stalks 5-1 in. long from a woody hemispherical torus 1 in. in diam. often with one or two shallow transverse depressions. *Seeds* numerous oval, compressed, shining.

Holongapar Reserve, SIBSAGAR DISTRICT, and possibly elsewhere in similar localities.

The ripe carpels are eaten.

Fls. 5-6, Fr. 9-11.

4. *Uvaria lurida*, Hk. f. & Th.

A large woody climber ; young parts with rusty-stellate scales. *Leaves* 4-7.5 by 1.25-2.4 in., oblong, oblong-lanceolate or oblanceolate, acute or shortly acuminate, rounded or subcuneate at the base, coriaceous, adult glabrous, dark-green and shining above, dull-green underneath ; main lateral nerves 8 to 10 on either half with often a few shorter ones between ; petiole 1.5-2.5 in. long incurved, verrucose. *Peduncels* terminal or leaf-opposed, 1-2 flowered, about 1 in. long, elongating in fruit, ebracteolate rough with scales ; buds globose (club-shaped with the peduncle). *Flowers* 1.5-2.25 in. across. *Sepals* 3, connate at the base, verrucose

outside, pubescent inside. *Petals* 6, uniform, in 2 series and imbricate until fully open, afterwards apparently in a single whorl with valvate margins, broadly ovate, with inflexed tips; brick-red, densely scaly-pubescent outside, minutely pubescent within. *Anthems* about .15 in. long, cuneate with truncate tips. *Carpels* numerous, stalked. *Ripe carpels* 1.2-1.7 by .6-.7 in. cylindrical but narrowed and strongly 3-quetrous at the base, 3-6 seeded; stalks 4-6 in. long. *Seeds* in a single row compressed or globose.

Northern slopes of the KHASI HILLS, up to 2,500 ft., c. g., near Um-Ran.

Fls. 3-5. Fr. 8-11.

12. ARTABOTRYS, R. Br.

Artabotrys caudatus, Wall. Vern. *Dhupa-lota*, Ass.

A large woody climber; young shoots pubescent. *Leaves* 3-5 by 1.2-2.2 in. oblong or elliptic, abruptly bluntly-acuminate, margins often slightly recurved, subcoriaceous, glabrous; lateral nerves 8-12 on either half arched and looped to form intermarginal veins, tertiaries laxly reticulate; base cuneate; petiole .2-.3 in. long. *Flowers* .6-.8 in. long, brown-silky 2-6 from the extremities of recurved and laterally-compressed peduncles. *Sepals* about .15 in. long, broadly triangular-ovate, pubescent. *Petals* .6-.8 in. long, narrowed to the apex, rusty-silky. *Ripe carpels* 4-5, 2 in. long, elliptic, dark-purple. *Seeds* 2, 1 by .6 by .25 in., brown, compressed, rugose, with shallow grooves along the faces and edges.

Garampani SIBSAGAR DISTRICT: Makum Range, LAKHIMRUR DISTRICT, and possibly in all evergreen forests between those two localities.

Fls. 3-5. Fr. 10-12.

13. OXYMITRA, Bl.

Oxymitra fornicata, Hk. f. & Th. Vern. *Mota-bokol-bih*, Ass; *Dumakhal*, Garo; *Rampun-kung*, *Hruirang-moniai*, Tipp.

A woody climber, somewhat gregarious in habit; young shoots brown silky-pubescent, stem dark-brown. *Leaves* 4-7 by 1.3-2.5 in., obovate, oblong or oblanceolate, membranous, glabrescent above, softly pubescent especially along the midrib and nerves beneath; lateral nerves 14-18 on either half, nearly straight, tertiaries transverse to the secondaries, more or less straight and parallel; base subacute or abruptly rounded, sometimes slightly cordate; petiole .2-.3 in. long, densely rusty-tomentose. *Flowers* large, 6-7 in. across when fully-developed, green to pale-yellow, solitary and leaf-opposed or 2-3 on short leafless shoots; peduncles .5-.8 in. long, rusty-pubescent, bracteate at the middle, or sometimes only a little above the base. *Sepals* .6 by .2 in. ovate, acuminate, membranous, pubescent, deciduous. *Petals* membranous, pubescent, outer 2-4 by 1.1-1.7 in., flat, 5-7 nerved, inner much varying in size from .3 by .2 to 3.2 by 1 in.,

—conniving by a flexure at the base over the carpels and stamens. *Ripe carpels* about 10, subsessile, '6-1 by '2-3 in., cylindrical, verrucose, coppery-puberulous.

There appear to be two varieties of this plant.—1. *Leaves* elongate, subacute at base, sparsely pubescent underneath when mature; *inner petals* small.—2. *Leaves* ovate or obovate, with a rounded or subcordate base, more densely pubescent underneath; *inner petals* only slightly smaller than outer.

The commonest Anonaceous plant in all evergreen forests of ASSAM.

Fls. 4-6. Fr. 10-12.

14. MELODORUM, Dunal.

Climbing shrubs. *Flowers* terminal, axillary or leaf-opposed solitary or fascicled; buds triquetrous. *Sepals* 3, small, valvate connate below. *Petals* 6, valvate in two series; of the inner series, triquetrous above, hollowed and concave below. *Stamens* numerous; anther cells contiguous, dorsal. *Carpels* many, free style oblong; ovules 2 or more. *Ripe carpels* berried.

1. Leaves usually densely pubescent on both surface :—

A. Flowers solitary or fascicled :—

Stalk of ripe carpels 4-8 in. long.

Stalk of ripe carpels '2-3 in. long.

B. Flowers solitary and axillary or in false

terminal panicles of 4-6 flowers :—

Stalk of ripe carpels 1-1½ in. long.

- II. Leaves wholly glabrous at least above :—

Flowers solitary or in fascicles of 2-3, stalk

of ripe carpels 1 in. long.

Flowers cymose, about '25 in. long,

Flowers cymose, minute.

1. *M. verrucosum*.

2. *M. bicolor*

3. *M. rubiginosum*.

4. *M. Wallicfii*.

5. *M. polyanthum*.

6. *M. rubinerve*.

1. *Melodorum verrucosum*, Hk. f. & Th. Vern *Jyrmisoh-ram-khlou*, Khasi.

A large woody climber; young shoots rusty-tomentose; stem lenticelled. *Leaves* 4-6 by 1½-2 in., oblong or oblong-lanceolate, acute or acuminate, thinly coriaceous, glabrous above except on the puberulous midrib, softly rusty-tomentose beneath, pinkish-brown when very young; lateral nerves 15-18 on either half, very oblique, almost straight, open with a few very short intermediate nerves, tertiaries very fine, about '05 in. apart, subparallel; base rounded or sub-acute; petiole '3-4 in. long, rusty tomentose. *Flowers* solitary, generally leaf-opposed, pale-yellow, delightfully scented, '5 in. long, on bracteate peduncles '6-1 in. long. *Sepals* '2 in. long, broadly ovate spreading, tomentose outside. *Petals* minutely tomentose or puberulous outside. *Carpels* strongly tubercled, rusty pubescent, young club-shaped, ripe globose, 1½-2 in. in diam., often with a sharp ventral ridge; stalk 1-6 in. long, stout, expanding upward. *Seeds* in two rows closely packed ridges along the edge; pulp aromatic, edible.

MIKIR HILLS and the Nambor Res. SIBSAGAR DISTRICT; Dirju, NORTH LAKHIMPUR; Nongstion, Raliang, Shongdaim, etc. about the foot of KHASI HILLS; possibly in all ever-green forests of Assam especially near hills. The ripe berries are eaten with much relish.

Fls. 3-5. Fr. 10-1.

2. *Melodorum bicolor*, Hk. f. & Th. Vern. *Hed-bheduti*, Ass. (Sibs.); *Moja-kotta* Daff.; *Rhuibom* Kuki.

A large woody climber; stem black; bark fibrous, brown inside, turning deeper-brown on exposure; young shoots rufous-hairy. *Leaves* 3-7 by 1-3 in., oblong or elliptic-oblong, generally rounded at both ends, thinly coriaceous, glabrous above except on the midrib; pilosely adpressed hairy underneath, the hairs sometimes varying in colour from light-grey to dark purplish-brown; main lateral nerves 16-20 on either side of the midrib; often with shorter intermediate ones between, slightly arched, not looped, tertiaries sub-transverse and sub-parallel; petiole 2-5 in. long, swollen, slightly channelled, densely rufous-tomentose. *Flowers* generally leaf-opposed, 7-9 in. long, on peduncles 2-3 in. long which are bracteate at the base. *Sepals* ovate, spreading, rufous or grey pubescent outside; glabrous inside. *Petals* leathery; outer 6-8 in. long, ovate, yellowish, densely rufous or tan-silky outside, glabrous inside; inner smaller, deep-red, glabrous. *Carpels* densely tan-silky. *Ripe carpels* about 1 in. diam., globose, mucronate, pubescent, on stalks 25-35 in. long; torus spherical; seeds 4-8 oblong.

Fairly common in ever-green forests in LAKHIMPUR, SIBSAGAR and DURRANG, also in the SURMA VALLEY.

Fls. 3-4. Fr. 8-10 (?)

3. *Melodorum rubiginosum*, Hk. f. & Th. Vern. *Thir Kalrang* (*Galwang*) Garo.

A large woody climber; young parts rusty-tomentose. *Leaves* 3-10 by 1-4.5 in., oblong or elliptic, acute or abruptly cuneate or rounded at the base, coriaceous, pubescent or tomentose along the stout midrib and nerves otherwise glabrous above, densely rusty-velvety beneath; lateral nerves 12-14 on either side of the midrib very prominent, oblique, only curving at the outer extremity otherwise straight; tertiary nerves, transverse to the secondary, parallel; petiole stout, 4-5.5 in. long, densely rusty tomentose. *Flowers* axillary, solitary or in pairs, sometimes in false terminal panicles of 4-6 flowers due to the fall of the upper leaves, delightfully scented; pedicels 8-12 in. long with 1 or 2 small ovate bracteoles. *Sepals* 1 in. long broadly ovate, acute, spreading. *Petals* with a broad concave base, outer 1-1.2 in. long, oblong, acuminate, inner more fleshy, smaller and narrower with a thick triquetrous limb. *Stamens* numerous; anthers linear; connective with a thin spatulate apical process. *Carpels* 8-10 densely silky; style short; ovules many, in 2 rows. *Ripe carpels* 1-1.2 in. long, obliquely ovoid, tomentose; stalks 1-1.5 in. long.

Chandkhira in SYLHET; Rongrengiri, GARO HILLS; and possibly in all other similar intermediate localities between those two points.

Fls. 11-1.

4. *Melodorum Wallichii*, Hk. f. & Th.

A large woody climber; branchlets often cirrhiform; young parts slightly yellow-pubescent. *Leaves* 3-5.5 by 8-1.5 in.,

oblong-lanceolate, acuminate, slightly rounded or sub-cuneate at the base, thinly coriaceous, glabrous and green above, sparsely adpressed-pubescent and pale beneath; lateral nerves 10-12 on either half, oblique, slightly arched; petiole 2-25 in. long, terete, slightly channelled. *Flowers* about 7 in. long, generally leaf-opposed, solitary or in fascicles of 2-3, with 1-3 bracteoles at the base; pedicels 15-3 in. long, elongating in fruit. *Sepals* 25 in. long, ovate, connate at the base, puberulous. *Petals* fleshy, outer 65 in. long, oblong-lanceolate, densely rufous-velvety outside, glabrous inside, inner shorter. *Stamens* numerous; filaments short; anthers linear with short, conical connectives. *Carpels* oblong, oblique. *Ripe carpels* about 1 in. long and 75 in. diam., ovoid, mucronate; stalks 1-14 in. long.

CACHAR. c. g., Phulertal; UPPER ASSAM and the KHASI HILLS.
Fls. 11-12.

5. *Melodorum polyanthum*, Hk. f. & Th. Vern. *Karle-phingnu*, Mik.

A large woody climber; young shoots very minutely puberulous or glabrous; stem dark coloured. *Leaves* 35-7 by 15-24 in., oblong, elliptic or obovate, finely acute or shortly acuminate, subcoriaceous, minutely puberulous along the closely reticulated tertiary and quaternary nerves above, more palpably on the larger nerves and beneath; lateral nerves 16-20 on either half, slender but raised and conspicuous underneath, only slightly curved near the free outer extremities, tertiaries very fine, parallel, transverse to the secondaries; base rounded or subacute; petiole 3-4 in. long, swollen, finely channelled. *Cymes* short, leaf-opposed or often slightly below the level of the axils, usually 4-8-flowered; pedicels 2-3 in. long, densely buff-pubescent, bracteate about the middle. *Flowers* 3 in. long, pale-orange, sweet-scented. *Sepals* 15 in. long, broadly ovate-triangular, spreading, puberulous. *Petals* 2-25 in. long, broadly ovate, leathery, buff-silky outside, inner smaller, buff-puberulous outside especially at the tips. *Carpels* and their styles hairy.

Barpathar, Garampani and Tengalibam, SIBSAGAR and possibly in similar localities, generally along edges of glades or streams in ever-green forests.

The ripe fruit is eaten by the Mikirs.
Fls. 11-2. Fr. 7-9. (?)

6. *Melodorum rufinerve*, Hk. f. & Th.

An imperfectly known large woody climber with slender dark-coloured glabrous branchlets. *Leaves* 5-10 by 2-4 in., elliptic, tapering to an obtuse or acute point, rounded or retuse at the base, thinly coriaceous, glabrous above, minutely pubescent and glaucous beneath; lateral nerves 12-14 on either half, slender, arching; petiole 5-65 in. long, glabrous. *Flowers* minute in few-flowered, leaf-opposed pubescent cymes; pedicels 25 in. long with a small bracteole about the middle. *Sepals* broadly ovate. *Petals* fleshy.

Believed to occur in SYLHET and CACHAR.

FAM. 5. MENISPERMACEÆ.

Usually climbing or twining shrubs ; wood with broad, medullary rays and large pores in wedge-shaped groups. *Leaves* alternate, simple, entire or lobed, rarely distantly toothed, usually palminerved, exstipulate. *Flowers* small, dioecious or polygamous. *Sepals* generally 6 in two whorls of 3, rarely 4-12, those of the outer whorl minute. *Petals* generally 6, similar to the sepals, exceptionally 3, or 3-5-8. **MALE FLS.** : *Stamens* usually 6, opposite to the petals, free, or forming a column on which the anthers are borne. **FEM. FLS.** : *Carpels* 3, distinct, rarely 1,6 or more, usually 1-ovuled. *Staminodes* 6 or 0. *Style* terminal in flower, generally lateral or sub-basal in fruit. *Ripe carpels* drupaceous, 1-seeded. *Seed* curved, with a woody endocarp ; albumen even or ruminate or 0.

- I. *Leaves* ovate or orbicular, generally not much longer than broad :—
 - A. *Leaves* peltate or sub-peltate, style scar basal or sub-basal :—
 1. *Petals* free :—

Leaves generally glabrous.
Flowers in axillary pedunculate umbels, style 3-6 partite. ... 1. *Stephania*.

Leaves pubescent. *Flowers* in axillary panicles ; style 2-partite. ... 2. *Pericampylus*.
 2. *Petals* connate in male flowers, solitary in female :—

Male flowers cymose, female racemed ; sepals 4 free : style 3-fld. ... 3. *Cissampelos*.

Flowers in axillary panicles :—
Male calyx 4-5 lobed. *Male petals* 4-6. ... 4. *Cyclea*.

Male calyx 4-lobed. *Male petals* 0. ... 5. *Lophophyllum*.
 - B. *Leaves* not peltate :—
 1. *Style* scar terminal or sub-terminal ; *Flowers* racemed, or paniced, generally axillary :—

Leaves glabrous. *Filaments* connate : stigma capitate, seed flat. ... 6. *Aspidocarya*.

Leaves glabrous or not. *Filaments* tree : stigmas forked : seed curved or ventrally grooved. ... 7. *Tinospora*.
 2. *Style* scar sub-basal. *Flowers* in axillary panicles. *Leaves* hairy at the nerve axils. ... 8. *Anamirta*.
- II. *Leaves* oblong or oblong-lanceolate, generally 2-3 times longer than broad :—
 - A. *Leaves* coriaceous, acute or more or less rounded at the base glabrous (in the species here dealt with.) :—

Leaves 3-nerved at the base. *Flowers* paniced
Style-scar sub-basal :—
Anthers cells bursting vertically. *Style* compressed. ... 9. *Limacia*.

Anther cells, bursting transversely. *Style* cylindrical. ... 10. *Cocculus*.

Leaves 3-nerved. Flowers racemed.
Leaves penninerved. Flowers in axillary
fascicles or panicles.

B. Leaves membranous, generally sagittate at the
base, softly pubescent beneath: style-
scar sub-terminal.

1. *Exc.*—Leaves often elongate in some species of *Stephania* not included in
this Flora and often not peltate in *Cissampelos Pariera*.

11. *Hæmatocarpus*.

12. *Pycnarrhena*.

13. *Parabana*.

1. STEPHANIA, Lour.

Glabrous climbers. *Leaves* peltate, orbicular or deltoid. *Flowers*
in simple or compound axillary umbels. MALE FLS.: *Sepals*
6-10, free. *Petals* 3-5, fleshy. *Anthers* 6, forming a ring on the
top of the column formed of connate filaments. FEM. FLS.:
Sepals and *petals* 3 each. *Carpel* solitary; style 3-6 partite. *Drupe*
globose, glabrous; endocarp horse-shoe shaped, dorsally tubercled.

Leaves elongate-deltoid, petiole not exceeding 2 in.
in length; umbels lax, long-peduncled.

Leaves ovate-deltoid; petiole up to 4 in. in length
umbels capitate,

Leaves orbicular; petiole up to 7 in. in length;
umbels cymose.

1. *S. elegans*.

2. *S. hernandifolia*.

3. *S. glandulifera*.

1. *Stephania elegans*, Hk. f. & Th. Vern. *Mi-soh-iong-rüt*.
Khasi.

A small climbing shrub; main stem spirally fluted; branchlets
slender, slightly angled, glabrous. *Leaves* 2.5-4 by 1-1.7 in.,
peltate, deltoid, acute, usually truncate at the base, thinly
coriaceous, glabrous, pale beneath; main nerves 4-6 besides the
midrib, all basal; petiole 7-1.5 in.; slender. *Flowers* small,
purple or greenish, in umbels with many rays; peduncles 1-2 in.
long, very slender. *Drupe* red when ripe, of the size of a
pepper-corn, endocarp tubercled on the periphery.

KHASI HILLS, 5,-6,000 ft.

Fls. 8-9. Fr. 3-4.

2. *Stephania hernandifolia*, Walp. Vern. *Tubuki-lot*, Ass.
(Sibs.); *Galdua*, Ass. (Garo Hills) *Nimukha*, Beng. *Kharkha*, Garo.

A climber winding clockwise round supports; branchlets
glabrous, striate. *Leaves* 3-6 in. long, often as broad as long or
broader, broadly ovate-deltoid, peltate membranous, wholly
glabrous, or glabrous and vivid-green above and pubescent or
thinly felted especially along the nerves, or pale or glaucous
beneath, margins even or wavy; basal nerves 8-10, tertiaries very
finely reticulate; petiole 1-4 in. long. *Flowers* yellow; ultimate
umbels often head-like with sessile flowers; peduncle axillary.
1-3 in. long. *Sepals* obovate. *Petals* 3-4. *Fruit* red when ripe,
3 in. diam., globose.

Fairly common especially in the SIBSAGAR DISTRICT.

The roots have medicinal properties and the leaves are applied on boils
and septic inflammations.

Fls. 2-4. Fr. 5-12.

3. *Stephania glandulifera*, Miers. Syn. *S. rotunda*, Lour. Vern. *Gana-grjo*, Nep.; *Soh-pung-un-lang-sang*, Khasi.

A large climber with tuberous roots, and rather fleshy branches; tubers globose, deep-yellow inside. *Leaves* 3-6 in. diam., orbicular, sometimes broader than long, usually peltate often with repand or lobed margins, membranous, glabrous; basal nerves generally 9, intermediate nerves very slender and finely reticulate; petiole 3-7 in. long. *Flowers* about 2 in. diam., yellow; peduncles axillary, 1.5-4 in. long. *Sepals* narrow-cuneate, puberulous; *petals* shorter. *Drupe* globose, 15-25 in. diam.

Laluk, NORTH LAKHIMPUR; Nauduar Reserve, DARRANG; KHASI-HILLS; Bamba block, GOALPARA.

The tubers are medicinal and the leaves are eaten by cattle and goats.

Fls. 11-1. (?) Fr. 4-5.

2. PERICAMPYLUS, Miers.

Pericampylus incanus, Miers. Vern. *Goria-loti*, Ass. *Baral-prati* Nep.; *Mi-syntneg*, Khasi.

A climber, grey-tomentose all over. *Leaves* 2-4 in. diam., orbicular or very broadly ovate, very narrowly peltate or not peltate at all, acute or obtuse, mucronate, membranous, pubescent or soon glabrescent above, grey-tomentose beneath, densely ciliate along the margins; basal nerves usually 5, tertiaries and quarter-naries very fine, minutely reticulate; base truncate or subcordate; petiole 1-2 in. long, tomentose. *Flowers* small in 2-3 crotomons cymes; peduncles axillary, fascicled, often superposed, 1-2 in. long, tomentose. *Sepals* 6 in 2 whorls, villous, inner spatulate. *Petals* 6, shorter than the sepals, cuneate, with recurved margins, pale-green. MALE FLS.: *Stamens* 6, free; anthers bursting transversely. FEM. FLS.: staminodes 6, clavate; carpels 3; style 2-partite. *Drupe* red, subglobose; style-scar sub-basal; endocarp horse-shoe-shaped, crested and echinate on the back.

Fairly common in NOWGONG and DARRANG, possibly also higher up the Valley; KHASI HILLS; CAHAR; GOALPARA.

The long branches are used in NOWGONG for tying purposes in house-building and are considered to be stronger and more durable than cane.

Fls. 4-5, Fr. ?

3. CISSAMPELOS, Linn.

Cissampelos Pareire, Linn. Vern. *Tubuki-lota*, or *Tabaki-lot*, Ass. (Sibs. & Lakh.); *Jyrmis-salla*, Khssi.; *Baral-panrhe*, Nep.; *Tupri-lewa*, Ass. (Kam.).

A dextrorse climber which grows annually from perennial rootstocks; young parts usually tomentose or pubescent. *Leaves* 1-4 in. diam., orbicular, peltate or not, obtuse or sometimes retuse, mucronate at the apex, membranous or subcoriaceous, pubescent above, grey-tomentose beneath, or both surfaces glabrate especially the upper; base cordate or truncate, 5-7-nerved with minute reticulations between, yellow before falling; petiole as long as, or longer than the blade, tomentose or glabrate.

MALE. FLS. : cymose. *Sepals* 4-6. *Petals* 4, connate into a cup; *filaments* connate into a column with 4 connate *anthers* on top, which burst transversely. FEM. FLS. : racemed and crowded in the axils of leaf-like bracts. *Sepals* 2; *petals* 0 (or sepal 1 and petal 1), 2-nerved. *Carpel* 1; style 3-fid. *Drupe* '15-'2 in. diam., obovoid-globose, compressed, hirsute, scarlet when ripe; style-scar near the base; endocarp horse-shoe-shaped with 4 rows of tubercles along the back.

Fairly common in all the DISTRICTS, especially on the MAJULI (where however the variety with peltate leaves is rare). ascending to 2000 ft. in the KHASI hills.

The leaves and roots, are in used medicine.

Fls. 10-1. Fr. 3-5.

3. CYCLEA, Arnott.

Cyclea peltata, Hk. f. & Th.

A slender climber; branches longitudinally ribbed and pubescent or glabrate. *Leaves* 2-4 by 1'8-3 in., sometimes upto 7 by 5 in., deltoid or ovate, peltate, thinly coriaceous, glabrous or sparsely pilose above, glaucous and thinly pubescent beneath; basal nerves 9-13; petiole 1-2'5 in. long. *Flowers* small in axillary panicles 5-8 in. long. *Sepals* and *Petals* more or less connate; calyx exceeding the corolla. *Anthers* 4-6, connate and borne on the edge of the column formed by connate filaments. FEM. FLS. : *Sepal*, *Petal* and *carpel* 1 each, style with 3-5 radiating lobes. *Drupe* about '15 by '12 in., globose or obovoid, pilose; endocarp horse-shoe-shaped, tubercled; style-scar sub-basal.

The climber undoubtedly occurs in UPPER ASSAM but is liable to be mistaken for *Cissampelos Pareira* or *Pericampylus incanus*.

Fls. 7-9. Fr. 11-1.

5. LOPHOPHYLLUM, Griffith.

Lophophyllum bicristatum, Griff.

A large climbing shrub. *Leaves* 3-7 by 2'5-5'5 in., ovate, broadly cordate acuminate, firm and coriaceous, glabrous above rusty-pilose beneath, palmately 7-9-nerved from the base; petiole 1'5-4 in. long, thickened at both extremities. *Inflorescence* a slender tomentose decompound panicle, axillary or from leafless nodes of the stem; *Flowers* minute. MALE; apetalous; FEM. : with 2 opposite lobed saccate sepals; buds '03 in. diam. *Anthers* 4-5, connate into a peltate disk. *Carpel* 1. *Drupe* '15-'25 in. diam. orbicular, compressed, tubercled.

KHASI HILLS. Hk. f. *Tā*. ! Apparently not very common. Distrib.—SIKKIM, BHUTAN, MANIPUR and BURMA.

Fls. 4-6. Fr. 8-10.

6. ASPIDOCARYA, Hk. f. & Th.

Aspidocarya uvifera, Hk. f. & Th.

A large evergreen climber; branches longitudinally ribbed. *Leaves* 4-6 by 3-5 in., ovate-cordate, tapering to an obtuse or

fine point, sometimes very narrowly peltate, thinly coriaceous, dark-green, glabrous or pubescent along the nerves beneath; basal nerves 5, tertiaries laxly, but quaternaries very finely and closely reticulate; petiole 3-4 in. long. *Flowers* in very slender panicles from axils of fallen leaves. *Sepals* 12 in several rows, greenish, ciliate; *petals* 6, cuneate, concave. MALE FLS.: *anthers* 6, on the top of the staminal column. FEM. FLS.: *staminodes* 6, club-shaped. *Carpels* 3. *Drupe* 7-1 in. long, compressed, keeled on the back, surrounded by a toothed wing; seed oblong, flat.

Raigarh, near Dilmoor, N. E. FRONTIER; Jaipur Res., LAKHIMPUR, and possibly in other similar localities in those two DISTRICTS. Also Dikranā Vally, DARRANG.

Fls. 2-4. Fr. 6-8.

7. TINOSPORA, Miers.

Succulent deciduous climbers with corky or papery bark, generally sending down long aerial roots from the branches of the tree on which they spread. *Leaves* generally cordate, not peltate, rather fleshy. *Flowers* in axillary or terminal racemes or panicles when the climbers are leafless. MALE FLS.: *Sepals*, *petals* and *stamens* 6 each, all more or less free; *anthers* oblique. FEM. FLS.: *Sepals* and *petals* 0; *staminodes* 6, club-shaped. *Carpels* 3. *Drupe* 1-3; style-scar terminal. *Seed* curved.

Leaves and new shoots glabrous:—

Bark corky, *Stamens* free. *Drupe* 3 in. long, globose; endocarp smooth.

1. *T. cordifolia*.

Bark warted. *Stamens* adnate to the base of petals.

Drupe 1 in. long, ellipsoid; endocarp tubercled.

2. *T. crispa*.

Leaves on both surfaces and young shoots hairy. Bark papery. *Drupe* 4-5 in. diam., sub-globose; endocarp tubercled.

3. *T. malabarica*.

1. *Tinospora cordifolia*, Miers. Vern. *Hoguni-lot*, Ass.; *Gulancha*, Beng.

A large succulent climber with corky bark; young shoots glabrous. *Leaves* 3-4 in. long and as broad, orbicular or broadly ovate-cordate, acute or shortly cuspidate-acuminate, glabrous; petiole 1.5-2.5 in. long. *Flowers* greenish-yellow, glabrous. MALES fascicled; FEMALES solitary on longer pedicels. Bracts boat-shaped, the lower ones often leaflike. *Petals* cuneate. *Stamens* free; *anthers* oblong. *Drupe* 1-3, about 3 in. diam., globose, shortly stalked, red and glossy when ripe.

Not uncommon in riparian forests e.g., Majuli, DISTRICT SIBSAGAR.

A starchy extract is obtained from a cold infusion of the aerial roots and the thicker parts of the stem of this plant, which is much valued by Hindu physicians as a tonic febrifuge. Elephants are very fond of the aerial roots which act as a good tonic on them.

Fls. 2-4. Fr. 3-4.

2. *Tinospora crispa*, Miers. Vern. *Hoguni-lot*, Ass.

A large glabrous climber; stem warted. *Leaves* 2-6 by 1-4 in., ovate-oblong, shallowly cordate at base, glabrous; petioles

1-3 in. long. *Flowers* yellowish-green: bracts 15 in. long, subulate fleshy. *Stamens* adnate to the base of the petals; anthers square. *Drupe* about 1 in. long, ellipsoid, pale-yellow.

Occurs in similar localities as the foregoing species and probably possesses the same economic utility.

3. *Tinospora malabarica*, Miers. Vern. *Hoguni-lot*, Ass; *Phrua-mek-rikang*, *Phuroi-rikang*, Mikir; *Doolhudi*, Kach; *Wapel-ek-rang*, Kuki.

A large fleshy climber; bark papery, usually with lenticels which are often 4-fid; young shoots pubescent. *Leaves* 3-5 in. long and nearly as broad, broadly ovate or orbicular, cordate but abruptly truncate or cuneate and 5-7 nerved at the base, suddenly acute or acuminate; pubescent above and whitish-tomentose beneath; main lateral nerves 1 or 2 on either side of the midrib; ultimate reticulations minute; petiole 2.5-4 in. long. *Flowers* green, on racemes 1.5-4 in. long. *Mature carpels* 1-3, .4-.5 in. diam., globose, turning at first yellow then bright crimson in ripening; endocarp tubercled.

Throughout UPPER ASSAM: the commonest species of this genus.

The stem tastes sweetish but is likely to possess the same medicinal properties as *T. cordifolia*.

Fls. 2-3. Fr. 3-5.

***Tinospora Mastersii*, Diels.** Pflanzenreich 46. Heft. p. 140 Syn. *T. crispa*, Miers, in part.

A climber with reddish brown warted bark. *Leaves* suborbicular acuminate membranous usually glabrous, 4-6 in. across, base reflex or subcordate, 5-7 nerved, lateral nerves usually 2 above the basal, prominent beneath. *Flowers* unknown. *Female* inflorescence racemose, 2-3.2 in. long, pedicels .5-.8 in. long, stout. *Drupe* juicy and fleshy, endocarp crustaceous, subreniform about .6 in. long.

Griffith, ASSAM!

Fls. 8.

8. ANAMIRTA, Colebr.

***Anamirta paniculata*, Colebr.** Vern. *Kakmari*, Beng. *Kakamari*, (crow's bane). Sans.

A powerful climber, wholly glabrous (except the axils of the nerves on the undersurface of the leaves); bark on old stems spongy outside and deeply cracked, smooth on branches, often sending down numerous rootlets. *Leaves* 3-10 by 2.5-8 in., ovate, shallowly cordate or truncate, bluntly sub-acute, coriaceous, glabrous, 3-5 nerved at the base, with 4-5 lateral nerves on either side of the midrib the axils of which are hairy, tertiary indistinct; petiole 1-5 in. long, generally twisted at the base. *Panicles* 12-15 in. long, drooping from the old branches. *Flowers* green, scented, about .2 in. diam, glabrous; buds globose, .1 in. diam. **MALE**: apetalous but with 6 deciduous sepals; stamens numerous with 2 celled anthers round the top of a central column. **FEMALE**: with 9 club-shaped staminodes, all in one series; *carpels* usually 3 on a short gynophore; style lateral. *Drupe*s

usually in pairs, '4-6 in. long, subglobose or reniform, black, on stout stalks; endocarp rugose; albumen oily.

Occurs in the same localities as *Tinospora cordifolia* and liable to be mistaken for it; also in the Khasi Hills.

The fruit is very bitter and is used to poison crows and fish. The oil of the seeds is said to be used for industrial purposes. An ointment prepared from the berries is used as an insecticide and in cases of obstinate skin diseases.

Fls. 5-9. Fr. 11-12.

9. LIMACIA, Lour.

Limacia cuspidata, Hk. f. & Th.

A somewhat stiff climbing shrub of the habit of *Smilax*; branchlets striate; very young shoots pubescent. *Leaves* 2-4 by '8-15 in., ovate elliptic or lanceolate, acuminate, coriaceous, glabrous, glossy, 3-nerved and more or less rounded at the base with only 1 or 2 lateral nerves on either side of the midrib; petiole '4-6 in. long. *Panicles*:—**MALE**: '8-13 in. **FEM.**: '5-6 in. long, from supra-axillary villous tubercles; rachis hairy; bracts minute. *Sepals* 6 in two series. *Petals* 6, much smaller than the sepals. *Stamens* 8-12 (Kurz.); *carpels* 3. *Drupe* '4 in. long, globose, slightly compressed; style-scar near the base; seed curved; endocarp faintly tubercled.

Only once found by the writer on the western bank of the Gaurisagar tank: SIBSAGAR DISTRICT.

Fls. 6-7. (?) Fr. 9-10.

10. COCCULUS, DC.

Climbing shrubs, often sub-herbaceous, rarely small trees. *Flowers* axillary or infra-axillary, in short cymes or panicles, rarely racemose. *Sepals* 6 in two series, the inner larger. *Petals* 6, auricled at the base. *Stamens* 6, embraced by the auricles of the inner petals; anthers sub-globose, cells bursting transversely. *Carpels* 3-6; *drupe*s compressed, horse-shoe-shaped, keeled and tubercled on the back; style-scar sub-basal.

Climbing shrubs:—

Leaves broader than long, glabrous. Panicles 6-24 in. long from old stem. Drupe 1 in. long, obovoid-oblong.

1. *C. macrocarpus*.

Leaves ovate glabrate. Panicles axillary, shorter than the leaves. Drupe '2 in. diam., tubercled.

2. *C. mollis*

A small tree:—

Leaves lanceolate, shining. Panicles axillary, Drupe minute, globose.

3. *C. laurifolius*.

1. *Cocculus macrocarpus*, W & A.

A large woody climber; old stem with papery outer bark; branches dark-grey, striate. *Scales* 2-3.5 by 2-2.5 in. generally broader than long, rhomboid to broad-ovate, chartaceous, glabrous, shining above, glaucous or pale beneath; base truncate or cordate, 5-nerved; petiole 1-2.4 in. long. *Panicles*

6-24 in. long, pendulous from the old stem. *Flowers* small, pale-yellow. *Ripe carpels* obliquely obovoid. '8-1 by '4-5 in., drying with an elongated depression in the centre; stone with transverse ridges.

KHASI HILLS, *Brandis* !

Fls. 2-5. Fr. 7-9.

2. *Cocculus mollis*, Wall, Vern. *Jyrm-mailum*, Khasi.

Branchlets blackish, slender, striate, pubescent. *Leaves* 1-5-4 by 1-2-2 in. ovate, acute or acuminate, truncate or suddenly cuneate, 3-5-nerved at the base, rarely cordate, thinly chartaceous, bright-green above, glaucous beneath, glabrate; lateral nerves 2-3 above the basal; petiole '6-1 in. long, slender. *Panicles* usually axillary never exceeding the leaves, few-flowered. *Petals* notched. *Drupes* '2-25 in. diam., very shortly pedicelled, laterally compressed, sculptured on the back and with four lines of tubercles along the sides.

KHASI HILLS, 5-6,000 ft., c. g., Sadew, Mawphlang etc.

Fls. 6-7. Fr. 9-10.

3. *Cocculus laurifolius*, DC.

A small evergreen tree with short trunk; branchlets grey or dark-brown, angled, uniformly striate, often pendulous, with a tuft of hairs at the base. *Leaves* 3-6 by 1-2 in., oblanceolate or elliptic, firm and chartaceous, glabrous, dark-green above, lighter green beneath, cuneate and 3-nerved at the base; petiole '15-5 in. long, often bearded at the base, *Panicles* axillary, solitary or 2 together, corymbose. *Flowers* minute; petals 2-lobed. *Styles* reflexed. *Drupe* '15 in. diam., black when ripe; endocarp rugose.

Amteka in the Bijni Reserve, GOALPARA. Probably also in other similar Sub-Himalayan swamps.

The wood has belts of bast tissue alternating with woody bands, simulating annual rings. They often anastomose or are spirally disposed on a transverse section. The wood can only be used as fuel.

Fls. 4-6. Fr. 9-12.

HÆMATOCARPUS, Miers.

Hæmatocarpus Thompsoni, Miers. Vern. *Inramji-dukha*, Kach.

A very large woody climber spreading over the tallest trees; bark pale grey or brown somewhat rough, branches stout, wood

long, oblong, oblique, dark-red outside and full of copious blood-red juice when ripe; style-scar about half way down the drupe; endocarp somewhat flat, crustaceous, densely fibrous.

Barail Reserve, NORTH CACHAR HILLS; also KHASI HILLS, Not common.

The ripe fruit which is full of a sweetish blood-red juice is eaten by the local people.

Fr. 4-5.

12. PYCNARRHENA, Miers.

Pycnarrhena pleniflora, Miers. Vern. *Holok-lota*, Ass. (N. Lakh.)

A woody climber which generally creeps on its supports; branches finely striate, pubescent. *Leaves* 5-7 by 1.5-2.5 in., oblong-lanceolate or oblanceolate, abruptly blunt acuminate, thinly coriaceous, wholly glabrous or puberulous on the midrib beneath, shining above; main lateral nerves 7-9 on either side of the midrib, the lowest pair subbasal, depressed above, very prominent beneath, interlacing to form intermarginal loops, tertiary laxly and quaternary very minutely reticulate (meshes about 50 along an inch length); base cuneate; petiole 4-5 in. long, swollen and channelled below, sub-terete. *Flowers* white, diœcious, axillary, fascicled. MALE: fascicles sometimes forming short congested panicles, *bracts* 3. *Sepals* 6, inner 3 larger, orbicular, concave. *Petals* 6, sometimes 5, small lobed; *anthers* 6-9, 4-lobed subsessile. FEMALE: on 1-2 flowered fascicled, bracteate, filiform, pubescent peduncles about .25 in. long; *bracts* 9, hairy; *sepals* 3, concave; *petals* 6, much smaller; staminodes 6 (?). *Drupe* .5 in. (?) long, broadly oblong, smooth style scar lateral, endocarp and seed reniform.

Mahmora, Gaurisagar tank and Majuli, SIBSAGAR DISTRICT: Panigaon and Bhoreli Reserve, NORTH LAKHIMPUR.

Fls. 2-4. Fr. 5-6 (?)

13. PARABÆANA, Miers.

1. *Parabæna sagittata*, Miers. Vern. *Chabailai-daugurung-gedeba*, Kach.

A rather slender climber, with milky juice; branches longitudinally ribbed. *Leaves* 3-8 by 2-4 in. ovate-cordate or sagittate, acuminate, entire or distantly toothed, membranous, glabrous or glabrescent above, softly tomentose beneath, basal nerves 7 besides 3-5 lateral nerves on either side of the midrib; petiole 1-4 in. long. *Flowers* small, axillary or slightly supra-axillary, solitary or geminate, few or many flowered, dichotomous cymes; common peduncles up to 1 in. long. *Sepals* 6, sub-equal, subacute. *Petals* cuneate, often lobed. MALE: *anthers* 6, horizontal on the top of the staminal column. FEMALE: *staminodes* 6, *Carpels* 3; *style* recurved. *Drupe* 2-2.5 in. long, globose; style-scar subterminal; endocarp subglobose, sharply tubercled on the back.

Lanka and other places in the neighbourhood of Lumding. DISTRICT NOWGONG; also KHASI HILLS up to 2000 feet.

Fls. 5-7. Fr. 10-11.

Tinomiscium micranthum, Diels in Pflanzenreich. Heft 46. P. 119.

A climber with deeply sulcate branches, young parts ferruginous pilose. *Leaves* 5·5-6·5 by 2·5-3 in. ovate oblong or narrowly ovate lanceolate, acuminate, glabrous above puberulous specially on the nerves beneath, chartaceous, base rounded to broadly cuneate, with 5-5 nerves, lateral nerves 2-3 (above the basal) on either side, ascending prominent on the undersurface; petioles 2-2·5 in. long. *Male flowers* in pubescent, spicate racemes 1·5-2·5 in. long, several of which are fascicled together from nodes on old wood. *Sepals* 9, 3 outer small, externally pubescent, inner 6 oblong, about .05 in. long. *Petals* 6, with involute margins, glabrous, slightly smaller than the sepals. *Stamens* 6, opposite the petals, free, subequal; filaments short, thick, dilated towards the apex; anthers introrse. *Female flowers* and drupe not seen. (In the genus, the female flowers have the sepals and petals similar to those of the male flowers; staminodes 6. *Carpels* 3, glabrous, stigma peltate-capitate. *Drupe* 5 or few aborted, compressed, exocarp fleshy, endocarp crustaceous dorsally convex, ventrally flat or slightly concave, not intruded; seeds with large flat cotyledons).

Rajbari, Assam, Watt. 11267 (the type for the species)!

Frs. 3.

FAM. 6. BERBERIDACEÆ.

Erect or climbing glabrous shrubs. *Leaves* alternate or fascicled, simple or compound, exstipulate. *Flowers* regular, yellow green or white. *Sepals* and *petals* free, hypogynous, caducous, in several series, usually imbricate. *Stamens* hypogynous, usually as many as the petals and opposite to them. *Carpels* 1-3, oblong; *style* short or 0; *stigma* dilated. *Fruit* usually baccate.

Climbing shrubs: leaves digitate. Flowers 1-sexual:

carpels 3:—

Stamens monadelphous. Leaflets up to 7.

Stamens free. Leaflets up to 9.

Erect shrubs. Leaves simple, pinnate or 2-3 pinnate.

Flowers 2 sexual: carpel 1:—

Armed shrubs. Frs. yellow, solitary, fascicled or racemed:—

Leaves simple.

Leaves pinnate.

Unarmed shrub. Frs. white, in panicles:—

Leaves 2-3 pinnate.

.. 1. *Stauntonia*.

.. 2. *Holboëllia*.

.. 3. *Berberis*.

.. 4. *Mahonia*.

.. 5. *Nandina*.

1. STAUNTONIA. DC.

Glabrous, climbing shrubs. *Leaves* alternate, digitate or pinnate; leaflets 3-7, petiolulate, entire, generally glaucous or pale beneath. *Racemes* axillary, solitary, or fascicled. *Flowers* 1-sexual. **MALE:** *Sepals* 6 in 2 series, linear. *Petals* 0. *Stamens* monadelphous. **FEM.:** *Carpels* 3. *Seeds* large, imbedded in a yellowish pulp; testa horny, black.

Leaves pinnately 3-foliolate:—

Racemes solitary or few.

Racemes numerous, fascicled.

Leaves digitately 3-7-foliolate.

.. 1. *S. Brunonianana*.

.. 2. *S. elliptica*.

.. 3. *S. filamentosa*.

1. *Stauntonia Brunoniana*, Wall.

A large climber; old stem softly grey-corky; branches often tubercled. *Leaves* pinnately 3-foliolate; leaflets 2.5-5 by 1-1.5 in. narrow elliptic or lanceolate, caudate-acuminate, entire, glabrous and shining above, somewhat glaucous beneath; nerves 6-8 on either side of the midrib, the first pair being basal, prominent beneath, midrib depressed above; petiole 2-5 in. up to the lowest pair of leaflets; petiolules of the latter .5-7 in. long. *Racemes* solitary, or a few from scaly tubercles; rachis slender somewhat zigzag. *Flowers* greenish-yellow, .3-6 in. across on very slender pedicels. 2-3 in. long. *Ripe carpels* about 2 by 1 in., ovoid or oblong, many-seeded; seeds black, 3-gonous, immersed in a yellow pulp.

Sadiya, N. E. F. DISTRICT; Balijan, SIBSAGAR DISTRICT; KHASI HILLS, Griffith! Hooker! etc.

Fls. 8-10. Fr. 2-6.

2. *Stauntonia elliptica*, Hemsl. Syn. *Paravatia Brunoniana*, Decaisne. Vern. *Krang-sin-dowha*, Kach.; *Jong-mot*, Kuki.

A large climber; branchlets striate. *Leaves* pinnately 3-foliolate; common petiole 2-5.5 in. long to insertion of leaflets, swollen and callous at the base; leaflets 2.5-4.5 by 1.4-2.7 in. elliptic or ovate, acute or rounded at the tip, subcoriaceous, glabrous, shining above, glaucous beneath; margins slightly recurved, lateral nerves 6-8 on either half, slender, the first pair or two subbasal with lax reticulations between; base as a rule rounded; petiolules lateral .4-1 in., terminal 1-2 in. long, swollen and callous at both extremities. *Racemes* 3-4.5 in. long in fascicles of 5-12 from imbricately bracteate axillary tubercles. *Flowers* greenish-yellow about .3 in. across, on filiform pedicels .2-4 in. long. *Sepals* 6, ovate or elliptic, longitudinally ribbed. *Petals* 6, smaller than the sepals. *Stamens* 6, monadelphous. *Young fruit* of 3 distinct carpels; *mature* generally solitary 3-4 by 2 in.; seeds dark-brown or almost black, shining, irregularly faceted, with a thin grey papery arillus (or exocarp?), imbedded in yellow pulp.

Garampani, Diphling, and Balijan, SIBSAGAR; Gauhati, KAMRUP; Sadiya and Dismor, N. E. FRONTIER; Haflong, N. CACHAR HILLS; Cherrapunji, KHASI HILLS.

Fls 8-11. Fr. takes 12 months to mature.

3. *Stauntonia filamentosa*, Griff.

A large climber with thick striated branchlets. *Leaves* digitately 5-foliolate; common petiole 3-6 in. long, swollen at the base; leaflets 5-7 by 2.2-3.4 in., oblong obovate, suddenly acuminate with a short tail, subcoriaceous, glabrous and green above, minutely densely glandular puberulous beneath; main lateral nerves about 10 on either side of the midrib, the first pair subbasal and continuous with the intermarginal loops of the other nerves; reticulations lax; petiolules .8-1.7 in. long, the terminal being the longest. *Flowers* and *fruit* not seen.

Upper Dehing Reserve, also Tingrai, LAKHIMPUR.